# PHASE II: ACCEPTABILITY TESTING OF THAI FPC-TYPE B AND THAI RDF AMONGST HOUSEWIVES IN CIVILIAN AND MILITARY ESTABLISHMENTS IN NORTHEAST THAILAND AND BANGKOK METROPOLIS

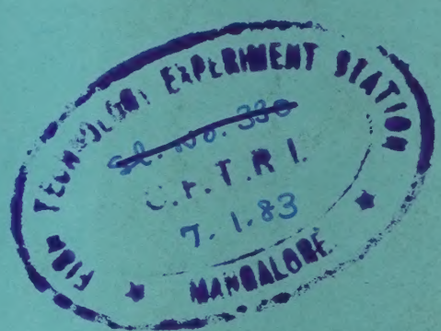

BY

BULAN PHITHAKPOL

SUKONCHEUN SRINGAM

NOI SARIKAPUTI

WACHARIN PIYARAT

INTEGRATED AND EDITED

BY

M.L. PRACHAKSILP TONGYAI



FOR THE

FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS

AND THE

INSTITUTE OF FOOD RESEARCH AND PRODUCT DEVELOPMENT

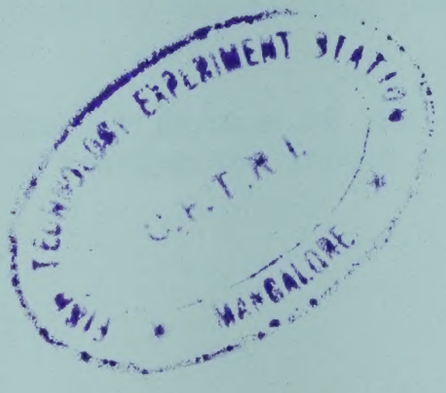
KASETSART UNIVERSITY, BANGKOK

NOVEMBER 1982

## PREFACE

The authors share responsibility for the project. Ms. Bulan Phithakpol of IFRPD, as team leader, directed all phases of the project and made critical contributions during the design phase. Dr. Sukonchuen Sringam of IFRPD supervised the preparation and modification of the recipes, and organized and conducted all tests and final tabulation of the results. Ms. Noi Sarikaputi of IFRPD prepared and modified the recipes and cooked all the meals used for the testing. Mr. Wacharin Piyarat of IFRPD prepared the RDF utilized.

M.L. Prachaksilp Tongyai*, as consultant, participated in the evaluation of the project results and prepared this report in the integrated and edited version.




* M.L. Prachaksilp Tongyai, Fellow: International Academy of Fisheries Scientists is a professional Development Consultant whose current occupation is Director of the newly created Food and Agriculture Development Center of the Bangkok Metropolitan Bank, Limited.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the financial and other support of the Food and Agriculture Organization of the United Nations (FAO) and the valuable suggestions of the FAO Fishery Industry Division staff.

Acknowledgements also go to the Commanding Officer and Staff of the Provincial Military Command, Royal Thai Army, Udorn Thani Province; the Ordinance and Quarter-Master's Departments of the Royal Thai Airforce, Bangkok Metropolis and the Officer-in-Charge and Staff of the Nong Wai Irrigation Project, Nam Pong District, Khon Kaen Province for their cooperation.

Acknowledgement is also made of the Fishery Technological Development Division, Department of Fishery, Thailand, for preparing the Pla-pon (PP) utilized in the testing programme.

Special acknowledgement is made of the IFRPD staff assistance during all phases of testing and report preparation.

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# CHAPTER I : INTRODUCTION

*"The human mind is a product of the struggle for existence. It is a tool-making, food seeking instrument which learns the right adjustment by a process of trial and error. Its working is experimental, its devices are utilitarian and its views tentative."*

*-- Darwin's Autobiography (1887).*

This report is considered Phase II of a programme which, in Phase I resulted in the "REPORT ON THE ACCEPTABILITY TESTING OF FISH PROTEIN CONCENTRATE-TYPE B AND ROLLER-DRIED FISH IN THAILAND," by Bulan Phithakpol and co-authors Sukoncheun Sringam, Noi Sarikaputi and Theodore Panayotou and published by the Food and Agricultural Organization of the United Nations and the Institute of Food Research and Product Development of Kasetsart University in Bangkok, May 1981.

Such reports were shared in Malaysia and documented as FAO/NORAD, 1982, Fishery products and the consumer in developing countries. Report of the FAO/NORAD Round Table Discussion on fishery products and the consumer in developing countries. Frazer's Hill, Malaysia, 11-16 January 1982. FAO Fish. Rep., (271):37 p.

All the acceptability analyses have employed the methods and procedures described and discussed in the report and document quoted above, thus they will not be described again in this Phase II Report.

## I.1 TERMS OF REFERENCE

The Institute of Food Research and Product Development will test the fish protein products produced with raw material from Thailand and these products will be evaluated by aceptability criteria used in Phase I.

The Institute will be provided with the following products:

(a) FPC Type "B" produced from Thai trash fish,in this report is called "Pla-Pon" (PP) provided by the Fishery Technological Development Division, Department of Fisheries and

(b) Minced trash fish meat from which the Institute will prepare a roller-dried product.

Both products will be formulated into prepared foods for the acceptability trials which will follow that utilized in Phase I.

## I.2 ACTIONS TAKEN

The Institute followed the general terms of reference stated above and the specifics documented in the Phase I Report.

## I.3 SITE AND SAMPLE SELECTION

Two rural sites were selected, namely, Khon Kaen (K) and Udorn Thani (U) Provincial towns and two urban sites were selected, namely , the Ordinance (O) and the Quarter-Master (Q) Departments of the Royal Thai Armed Forces.

These four sites contributed a sample size of 271 tasters, however, only 71.6 percent were able to taste all ten meals submitted by the research team.

The selection of tasters was limited to house-wives of military personnel of ranks Sub-Lieutenant and lower or house-wives who family's fixed monthly income is less than five thousand Bahts.

The military house-wives are, therefore, from the following sites:

1. *Provincial Military Command, Royal Thai Army*
   *-- Udorn Thani Province (U)*
2. *Ordinance Department, Royal Thai Air Force*
   *-- Bangkok Metropolis. (O)*
3. *Quarter-Master's Department, Royal Thai Air Force*
   *-- Bangkok Metropolis. (Q)*

The civilian house-wives are, from families whose husbands are civil servants of position classifications C-4 and lower or with

fixed monthly family incomes less than five thousand Bahts from:

*4. Nong Wai Irrigation Project, Nam Pong District, -- Khon Kaen Province. (K)*

Each site was subjected to 10 meals which contained Roller-Dried Fish (RDF) and Pla-Pon (PP) in comparison with fresh-fish dishes (four of each) and in repetition among RDF and PP (2-meals). But, as mentioned earlier only 71.6 percent actually got to taste all ten meals, with tasters of all ten meals as follows: (K) 66.7 percent, (U) 77.2 percent, (O) 64.8 percent and (Q) 83.3 percent.

# CHAPTER II : SOCIO-ECONOMIC BACKGROUND

*"The country wants today not so much a salvation from sin as social betterment which will transform the mass of people who are ill-fed, ill-clothed and ill-housed into a free community of well regulated families, living not in luxury, but in moderate comfort with no fierce or unhealthy competition."*

*-- Radhakrishnan's An Idealist View of Life (1932)*

## II.1 ABSOLUTE POVERTY:

It is of importance to recognize that the IBRD/World Bank defines Thai absolute poverty as $ US 90.00 (Baht 1,800.00) per year for rural dwellers and $US 120.00 (Baht 2,400.00) per year for urbanites, measured in 1975/76 prices ($US 1.00=Baht 20.00). By this definition, one quarter of the Thai population or about 11 million people live in a state of absolute poverty.

Over nine-tenths of all poor live in rural areas, with over half located in Northeastern provinces, about a quarter in the North, a tenth each in the South and Central provinces, and five percent in Bangkok Metropolis.

In terms of industry and occupation, the poor are concentrated in the agricultural sector and increasingly in unskilled labour categories throughout all sectors and regions.

On average, poor households in Thailand are headed by males, 34 years of age, with less than 3 years education. Family size is about 6.1 persons for urban dwellers and 6.4 persons for households in rural areas. A large majority of poor households have only one cash income earner and the great majority two or less income earners ...very rarely do poor households have fixed cash income earners.

In 1977 real income per capita in Bangkok was almost three times the Kingdom average and seven times the real income in the Northeast. Even within regions there exist great differences in villages. In 1975/76, villagers in the Northeast earned only 39 percent of

the urban income level. The urban-rural income gap appears to have increased over the 1962/63 to 1975/76 time period...except in the Northeast, where slow growth in both urban and rural areas caused less disparity.

Intra-municipal and intra-village income differentials are very much dependent upon occupation. The relative level of income can safely be predicted by occupation regardless of urban-rural or regional location.

## II.2 NUTRITION:

Protein-calorie malnutrition is a nationwide phenomenon in Thailand and pockets of extreme malnutrition exist in the Northeast and Bangkok slums.

There are several causes of malnutrition; subsistence food production has lagged behind population growth, especially in areas of arid soil and erratic rainfall, mainly in Northeast Thailand, making food relatively more costly and especially affecting low income families. Higher purchase costs in remote markets, dietary habits (high percentage of polished rice VS. Vegetables and meat), infant feeding practices (use of packaged milk and insufficient mother's milk) and disease and parasite infestation are also contributing causes of malnutrition.

## II.3 THE CAUSES OF POVERTY:

Differences in income can be explained by differences in access to income producing assets and opportunities for productive employment of these assets. Land/labour, capital (both physical and financial) and technology are the resources or assets available to an economy.

The Thai private sector has, generally, been credited with making an efficient use of available resources, but monopoly elements and concentrations of economic power have prevented a more equal distribution of income-producing assets and, hence, income itself.

## II.4 WHAT THIS PHASE II STUDY FOUND:

The tasters were predetermined by fixed monthly family incomes (Baht 5,000.00) and are dominated by military dependents (wives) and women employees. The fixed incomes of these families are determined by the Thai Civil and Military Services Commissions...with C-4 and Sub-Lieutenant ranks taking home less than 5,000 bahts gross fixed incomes. Thus, these tasters are not really representative of the lower income population of Thailand (based upon IBRD/ World Bank definitions and adjusted income rates).

At the same time these tasters are predominantly urbanized and/or influenced by peer-group normative behaviour in food selection because of the nature of their military service provisions in housing or/and incomes or/and welfare and civil service's social circles.

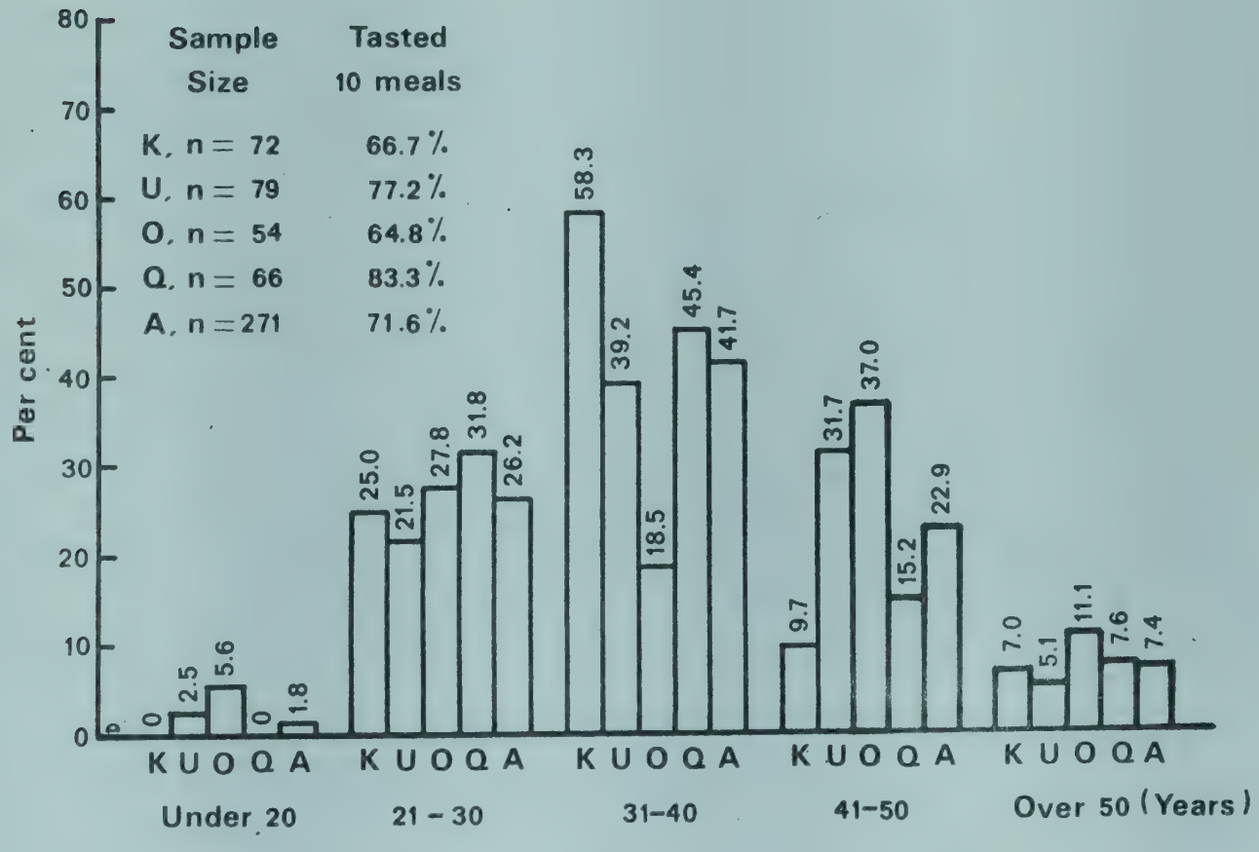



Chart 1 : Age distribution of tasters in Khon Kaen Province (K), Udorn Thani Province (U), Ordinance Department (O), Quartermaster's Department (Q), and Combined Average Percentage (A).....with percentage of 10 meals tasters.

## II.5 EDUCATION AND AGE DISTRIBUTION:

Education levels are often not high for those who have achieved their C-4 or Sub-Lieutenant ranks at higher ages (the majority of the tasters being over 31 years old...see Chart 1) because ranks are associated with initial and accumulated education level.

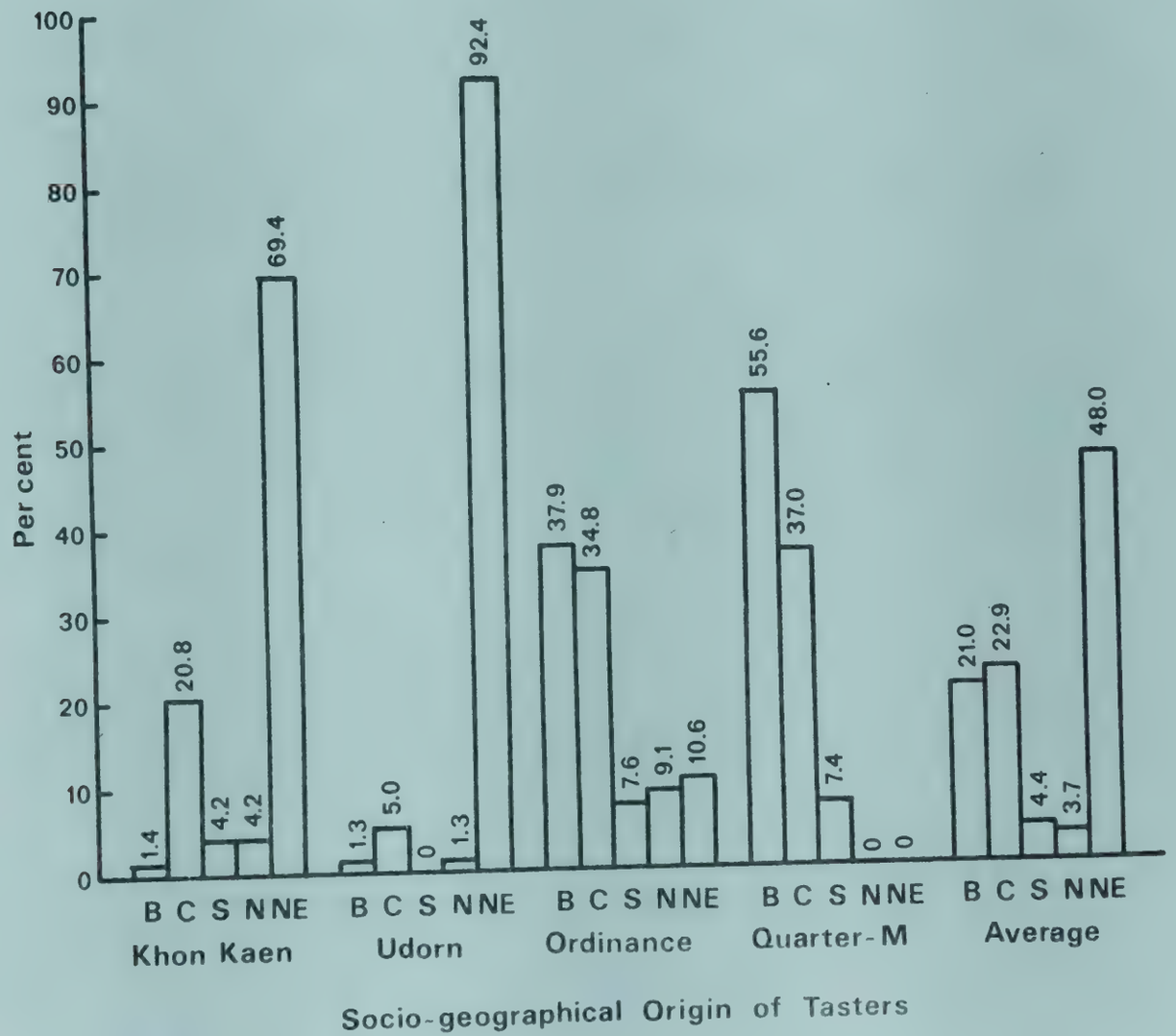



Chart 2 : Socio-geographical origin of tasters in Khon Kaen and Udorn Thani Provinces and Ordinance and Quartermaster's Departments ; Bangkok (B), Central Plains (C), South (S), North (N), and Northeast (NE).

## II.6 SOCIO-GEOGRAPHICAL SET:

The Socio-geographical background or origins of the tasters (see Chart 2) appears to be dominated by Northeasterners (average 43.0 percent) with the two Bangkok based Departmental housewives, from Bangkok and the Central Plains (Bangkok:(O) 37.9% (Q) 55.6% and Central Plains: (O) 34.8% (Q) 37.0%)

However, it should be noted that Khon Kaen displayed a high Central Plains contingent of housewives (20.8%) while Udorn had only 5.0%.

Such socio-geographical origins determines the degree of food preference and can account for the high acceptability of certain preparations put up for tasting.

Of difficulty to determine, however, is the degree of reliability to be expected from the low percentage of tasters over the 10-meals course of acceptability testing. On the other hand, these tasters belong to a stratum which is probably much higher than the absolute poverty portion of the population...thus, their choices may be biased towards meals which are not ordinarily accessible to absolute poverty families.

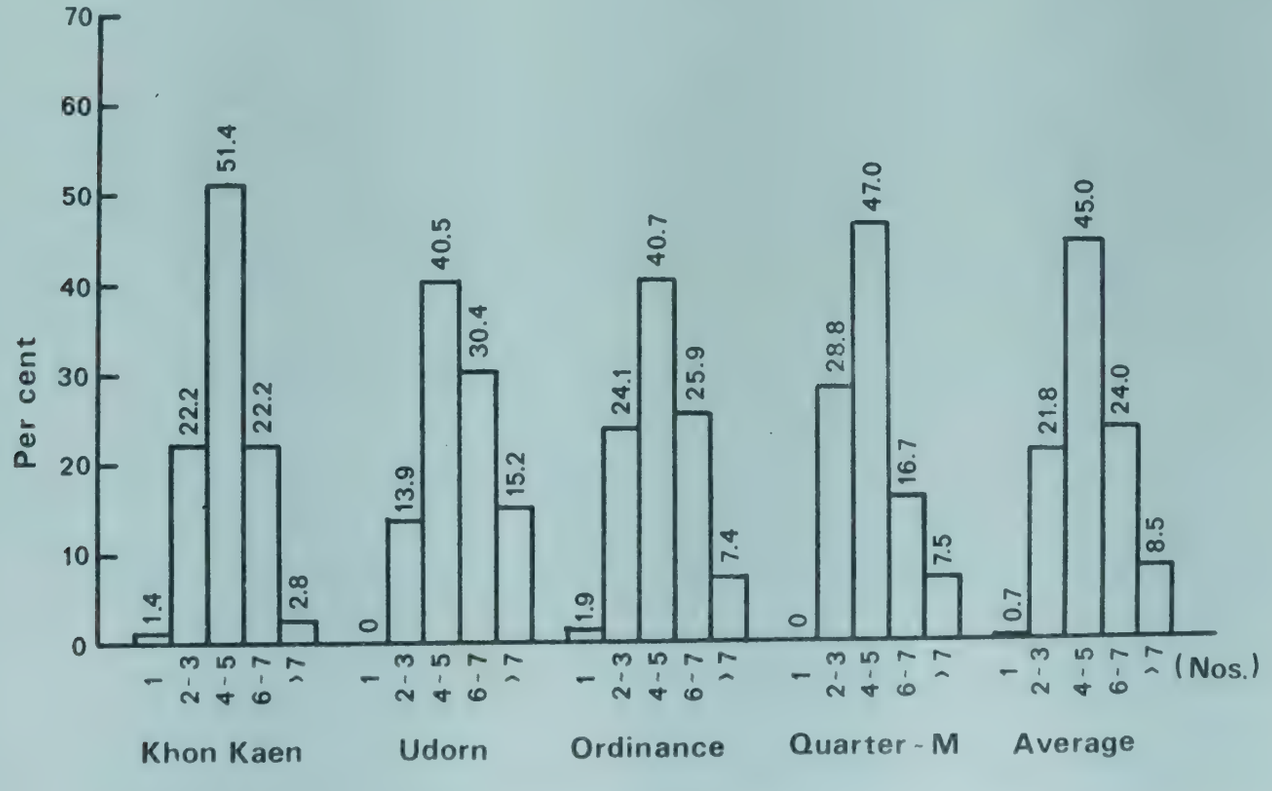



Chart 3 : Family size distribution of the tasters groups.

## II.7 FAMILY SIZE:

Chart 3 shows that the majority of these tasters have a family size larger than 4-5 persons, the families of 4-5 persons predominates (average 45 percent) but the families of 6-7 persons is very prominent (24.0 percent average, with 30.4 percent in Udorn Thani taster house-holds).

Such family size determines the purchasing power and the food choices of the person responsible for purchasing the raw foods and the type of finished product for the table...with socio-geographical background habits and considerations included.

The burden becomes clear when family size includes non-income earning members...especially children and elderly relatives. The number of elderly or other house-hold members was not surveyed, however it is clear that the majority of house-holds supported 3-4 children (see the average values in Chart 4) while the single dominant syblings number was in the 1-2 range (43.5% average).

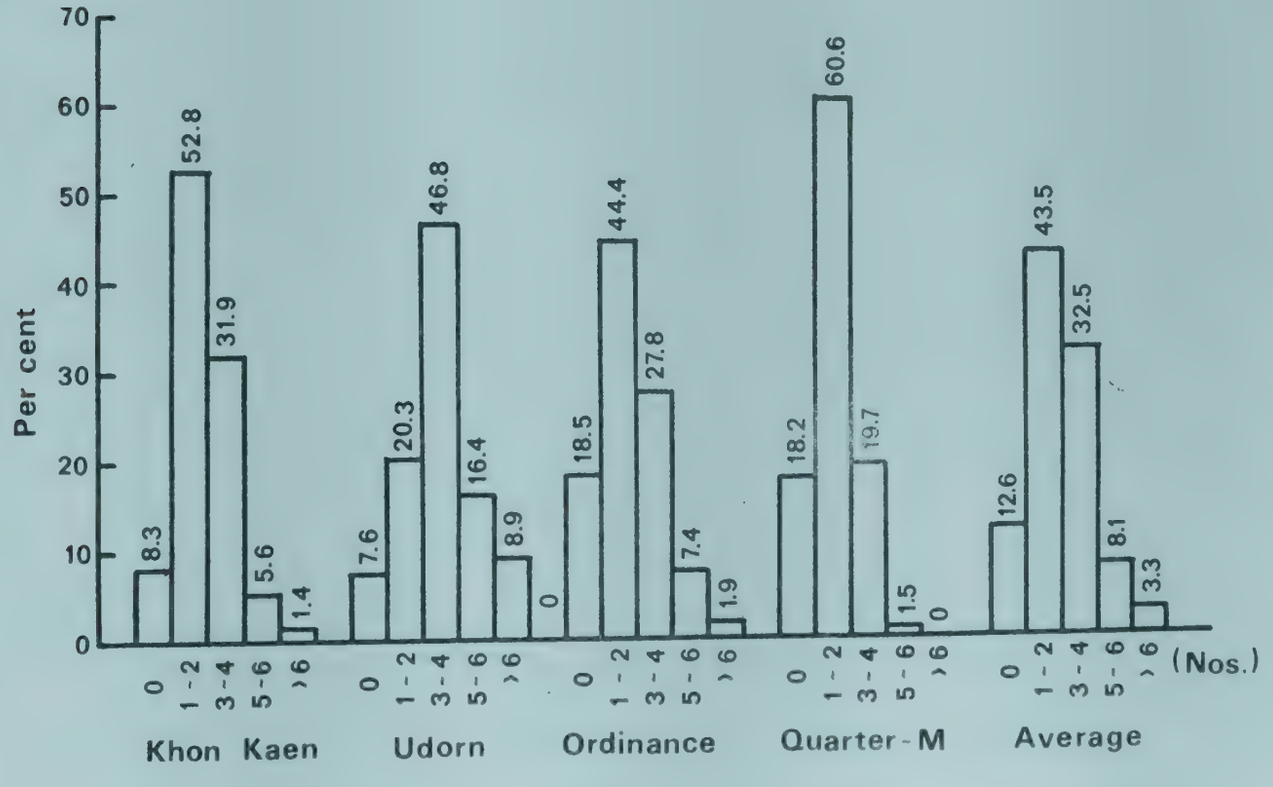



Chart 4 : Number of children per family of the tasters groups.

II.8 HOUSE-WIFE'S ROLE:

The tasters appear to be typical and universal in that the majority are responsible for the preparation of the food which the family consumes. However, they display a sizable proportion (even in the more rural areas of khon Kaen and Udorn Thani) who do not cook for the family (see Chart 5).

However, this is not surprising since some are widows...who are probably also the bread winners of the family, and thus would not have the time, energy and interest to do any cooking... which is probably why 1.2% indicated that they bought all their food ready to eat (see Chart 6).

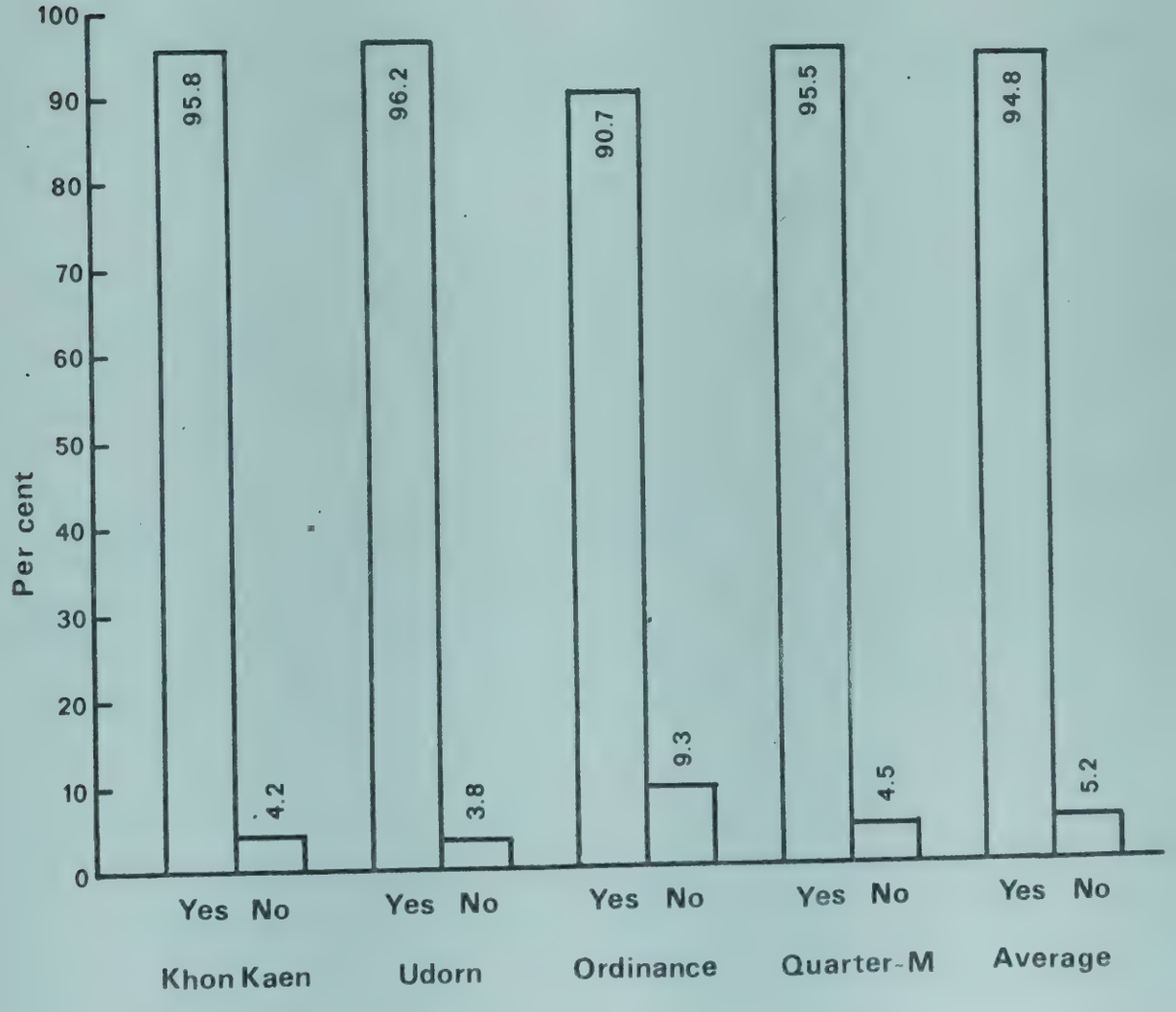



Chart 5 ; Response to the question : "Do you cook for the family?"

Chart 6 : Response to the question: "Do you cook everything, buy everything ready to eat, or do a bit of both?"

At the same time Chart 6 indicates that there is an urbanized convenience for all these tasters because a very high percentage indicated that some of their foods are ready to eat and cooked occasionally (48.0% average).

Such a practice indicates cash incomes on a regular basis and the availability of prepared food services. Thus, confirming quite clearly that these tasters are representative of only one narrow group of urbanized consumers whose income level is much higher than absolute poverty populations who should, in theory, benefit most from the addition of RDF and PP to their diets.

# CHAPTER III : PLA-PON PRODUCTION

*"Learning without thought is labour lost;*
*Thought without learning is perilous".*
*-- Confucious.*

## III.1 PRODUCTION OF RAW MATERIAL:

The annual wild fish catch of Thailand for 1975/76 was 1.5 million tons, with about 1.39 million tons from marine resources and 45% of the total marine catch considered and treated as "trash fish".

Trash fish (40%) is utilized for the production of fish meal (mainly for animal feed production) with a growing proportion utilized raw as duck and fish (pond culture of cat-fish and snake-head, fresh-water) feed.

## III.2 FISH MEAL:

At present there exists 66 fish meal factories in 15 coastal provinces of Thailand. The annual capacity is 192,800 tons...the largest factory's capacity is 10,800 tons/year while the smallest factory's capacity is only 120 tons/year.

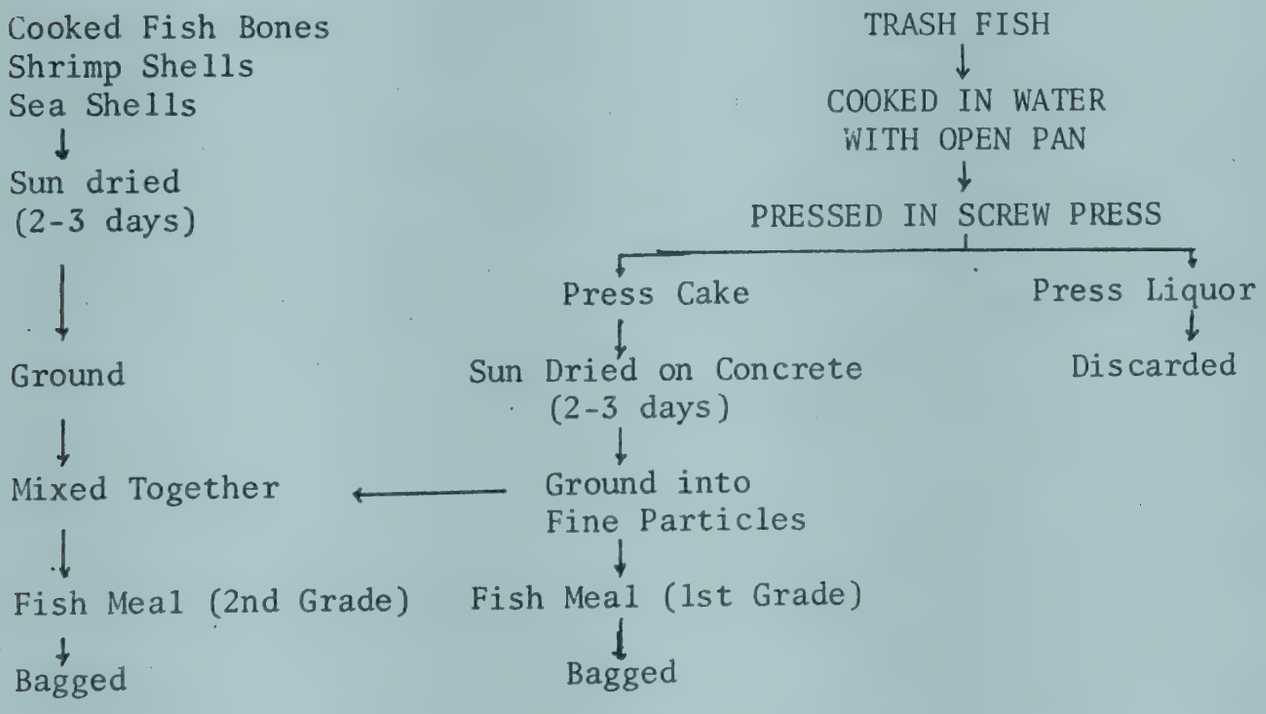
It is estimated that the actual production is around 50-60% of the production capacity, due to the trash fish supply problem from fishing pressure in Thai marine waters and the declaration of marine economic zones.

The quality of Thai fish meal is low due to the ship-board storage system which does not allow sufficient lowering of trash fish temperature during storage because it is low in economical value. It is also due to the processing system which does not de-fat the fish-meal prior to storage because fat content in trash fish is not high enough to pay for its cost, but high enough to cause rancidity and later would become infested with insects, because it is stored in used (old) 90-kilograms size gunny-bags without plastic lining.

## III.3 THE PRODUCTION OF FEED-GRADE FISH MEAL:

Marine fish catches are separated and the "table fish" are carefully packed in crushed ice to chill and to hold down the temperature of the highly marketable catch...while the multitude of species of small and immature fish under 10-cm. total length is considered "trash fish" and will be dumped into a fish-hold with no-ice (perhaps with salt).

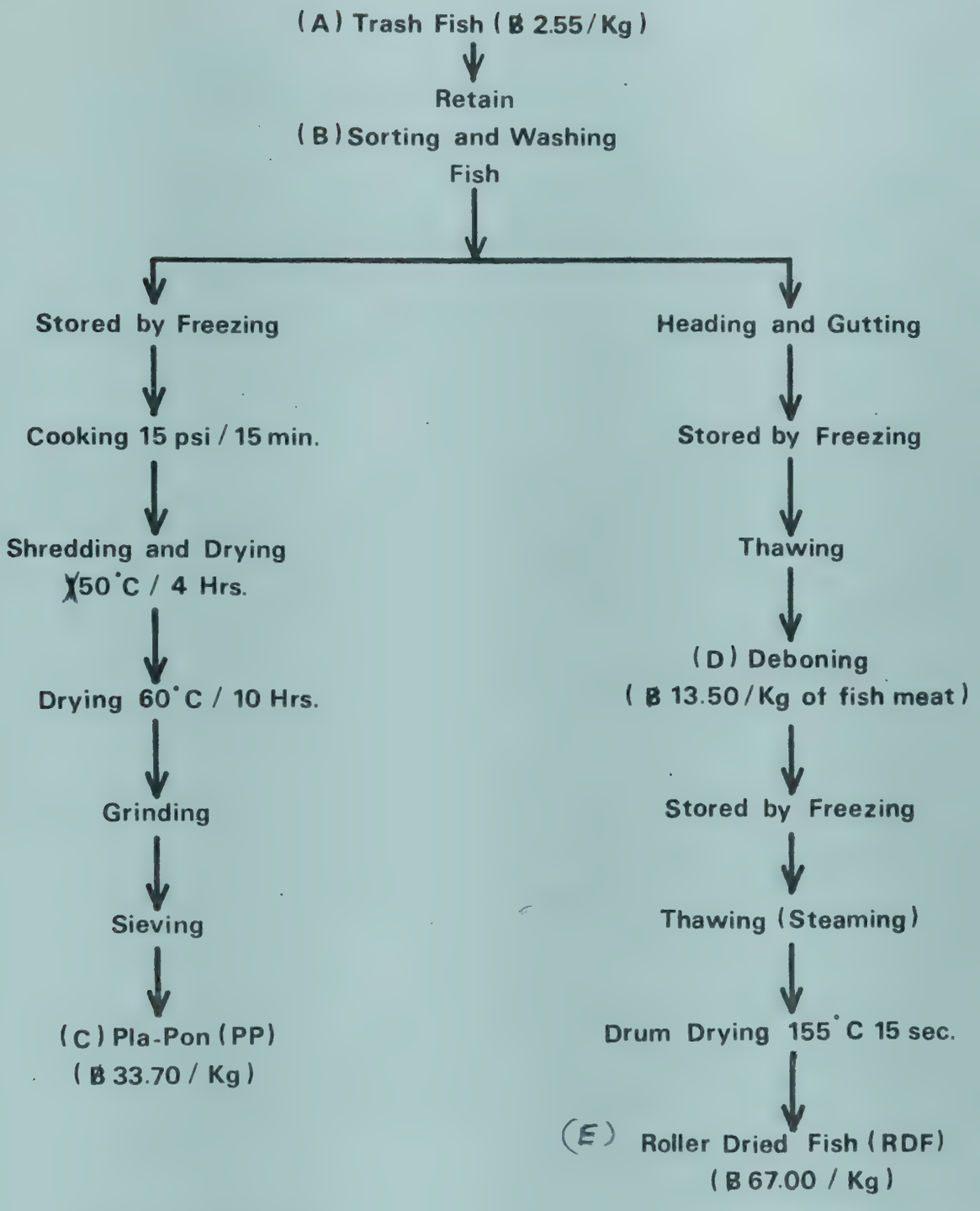
"Trash fish" are the feed-stock for feed-grade fish meal, which is produced in the steps described by Flow Chart 1 (traditional system still utilized).




Flow Chart 1: Fish meal production (animal feed) at about 6,656.00 Baht/ton (Source: ASRCT/UNIDO, 1978)

## III.4 PRODUCTION OF FOOD-GRADE FISH MEAL RDF AND PP:

It is desirable that the "trash fish" utilized has been properly chilled and kept cool through proper packing in ice immediately after being caught and washed. These "trash fish" are thus feed-stock for the food-grade fish meal RDF and PP utilized in this project as described in Flow Chart 2.




A ⟶ B 55% of A

B ⟶ C ~~55:1~~ 5.5:1

B ⟶ E 10:1

D ⟶ E 5:1

-: 1 US $ = ฿ 23.00 :-

Flow Chart 2 : Fish meal production (human food) to yield PP (at least 3,370 Baht / ton) and RDF (at least 6,700 Baht / ton).

## III.5 COMPARISON OF FEED-GRADE WITH FOOD-GRADE FISH MEAL:

It should be noted (see Flow Chart 1) that the press liquor is discarded in the traditional (Cottage industry) system of fish meal production. Thai commercial or industrial scale fish meal production attempts to utilize the press liquor to increase the protein content of the finished product, however, the energy costs have often hindered such utilization when local fish meal prices are also low.

Basically the lower price for Thai fish meal stems from the oil shock in combination with the over abundance of fishing trawlers and the fishing pressure which has dwindled catch sizes...thus, the benefits/costs ratio for trawler operation has decreased. Cost cutting has resulted in minimizing on the use of ice... the ice will be used only for squids, shrimps, shell-fish and other fish which are exported in frozen form, canned or sold to local restaurants for Sashimi (Japanese style raw-fish) and Seafood dishes.

The result being the low availability of ice for "trash fish", which commands low prices (less than Baht 2.55 per kilogram) and is often utilized directly as feed for laying ducks and freshwater (carnivorous) species of fish...with the bulk sales getting even lower prices from industrial producers of fish meal.

Fish meal as a result, is often rancid and of low quality, thus, unable to compete with imported soybean cake (from Brazil and the U.S.A.) in the mixed feeds industry of Thailand...which is closely related to broiler chicken production and processing to Japan (in competition with the U.S.A.)

Thus, the production of food-grade PP and RDF from Thai "trash fish" will be dependent upon the factors which will allow Thai fishing trawlers to properly handle and store their catch. This is easier said than done because the Thai fishing industry is still in debt for their engines, hulls, and fishing gear...not to mention operating costs.

If trawlers are specifically designated to clean and pack the "trash fish" so that the "quality" meets criteria set by consumer protection agencies and the medical nutritionists, it would mean that the "trash fish" must command prices close to that of "table fish" for export and restaurants.

However, such prices would escalate the cost for converting food grade trash fish into food grade PP and RDF by about 10 times, or to approximately Baht 25.00 per kilogram...which, in turn, would result in Baht 33,700 PP/Ton and Baht 67,000 RDF/Ton (Theoretically and without taking into consideration other cost factors).

At the same time, all steps of PP and RDF production which utilized "skilled labour" would have to provide a minimum of eight hours of work per day for a minimum of 240 days for each labourer in order to assure that they get annual/monthly incomes and benefits which are stipulated under current Thai labour law and controlled (partly) by labour unions.

Obviously the number of "skilled labourers" will have to be large in order that large volumes of fish may be processed into PP and RDF in coordination with the catching capacity of the specifically designated trawlers. The optimum size of an operating unit will have to be determined for handling the multi-species tropical trash fish catch (where as the Scandinavian trash fish are more homogenous) and will also be directly related to the demand for the PP and RDF in the Thai and other markets (which relies on Thai supplies).

At the same instant, it is possible (and very likely) that the other Thai fishing trawlers would wish to participate in supplying "food grade" trash fish...thus creating a pressure group demanding equal opportunity for economic returns (especially quoting debt repayments and other issues).

However, it is obvious that "food grade" trash fish in larger volumes will not fetch the same high prices as earlier, thus the returns will diminish and the fishing trawlers will lower their quality criteria for handling trash fish catches. But the supply/demand factors can help lower the price of food grade trash fish, which would be beneficial to PP and RDF manufacturers and consumers.

It is also due to cause problems in the "feed grade" trash fish sector...where the end products are duck eggs, ducks, broiler chickens, pork and chicken egg...and the consumer will suffer from higher prices of these products.

In order to keep these animal products prices down (due to political and market competition pressures) there will be increased demands for the importation of feed grade fish meal and soybean cake...which

will, in its turn, cause the depression of demand for local fish meal and soybean cake (in the latter case, soybean production is under strong promotion by the Ministry of Agriculture and Cooperatives of Thailand because there is increased demand for vegetable oil, tau-fu, and fermented soybean products in the Thai market... along with the substitution of imports which drains Thailand of valuable foreign currency).

Thus, the production PP and RDF in large proportions poses problems beyond ordinary taste and economic acceptability by Thai consumers, who are currently suffering from insufficient protein content in their daily diets. The integrated nature of "trash fish" conversion and utilization in the Thai socio-economic fabric indicates a multi-sectoral understanding is needed...a comprehensive approach will be required by planners and promoters of PP and RDF production from Thai raw materials.

ANALYSIS OF COMPOSITION:

The food-grade PP and RDF produced from selected Thai marine fish (mainly Pla Sai-Daeng or Thread fins, Family Nimipteridae) appears as Table 1, below:

Table 1 Analysis of composition of PP and RDF from Thai trash fish. (%)

| Content | Thai | | NORAD |
|---|---|---|---|
| | PP | RDF | RDF |
| Moisture | 6.06 | 4.87 | 10-14 |
| Fats (D.B.) | 12.85 | 9.02 | 2.27 |
| Proteins (D.B.) | 65.97 | 86.19 | 90.91 |
| Fibers | 1.11 | 0.49 | NA |
| Ash | 18.78 | 4.07 | NA |
| | 99.99 | 100.00 | NA |

## III.6 COMPARISON OF PP WITH RDF:

It should be noted that the protein content of PP is lower than of RDF, while both the Thai PP and RDF have very high fat content when compared with NORAD supplied RDF (Protein:PP/65.97% vs. RDF/86.19% and Fats:Thai PP/12.85% and Thai RDF/9.02% vs. NORAD RDF/2.27%)

The high fat content may cause the Thai PP and RDF to change faster than products utilized in Phase I project.

At the same time it is probable that special packaging will be needed to assure that PP and RDF can be distributed to inland consumers in acceptable condition. However, special packaging may increase the cost of PP and RDF so that it becomes economically inacceptable to the lower income groups.

On the other hand, a process may have to be devised to de-fat the PP and RDF so that the shelf-life increases. Again, this may increase the cost to consumers...even if it could mean that special packaging will no longer be needed.

# CHAPTER IV : ACCEPTABILITY OF PP AND RDF

*"The manifest objective of food aid to improve human nutrition presumably is derived from an underlying objective of reducing poverty, recognizing that poor health is a particularly pernicious aspect of poverty and that inadequate food is a major source of ill health."*
*--Mellor, John W. (1980)*

## IV.1 IN GENERAL:

Acceptability of PP and RDF has a basic foundation in the response to the question: "Does food fish have to be in chunks?"

The answers of the Khon Kaen and Udorn Thani tasters indicate acceptability of fish "not in chunks", but at the same instant implies that a preference for fish "chunks" is strong (especially when actual choice is available), see Chart 7.

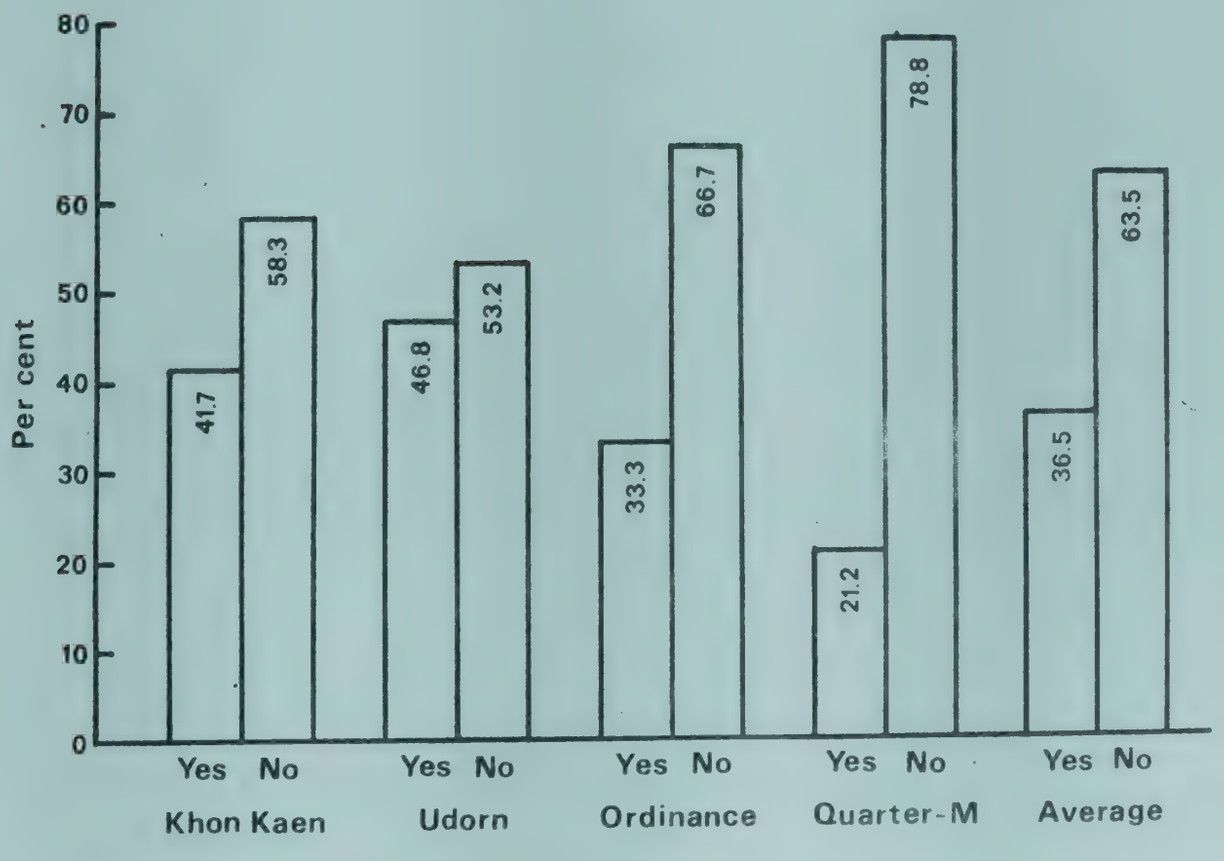



Chart 7 : Response to the question: "Does food fish have to be in chunks?"

This is because the "yes" responses are not too distant from the "no" responses (Khon Kaen: Yes/41.7%vs. No/58.3% and Udorn Thani: Yes/46.8% vs. No/53.2%).

However, there is a definite acceptance of "non-chunk" fish as food of the Bangkok based tasters working in the Ordinance and Quarter-Master's Departments (see Chart 7). This is possibly why Bangkok's lower income population has accepted the street-curb vendor's "khanom cheen nam ya" as their before dinner snack or final meal of the day. However, the "nam ya" will become more attractive to consumers if "chunks" of fish are found floating in the thick soupy sauce in the form of "luk chin pla" or "fish balls".

Again, it is likely that the "social norm" in food choice indicates that fish preparations are acceptable 2-3 times per week. This is considered a "social norm" because the first answer that will be given in regard to number of times fish is consumed per week will be "2-3 times" and prominently displayed in Chart 8.

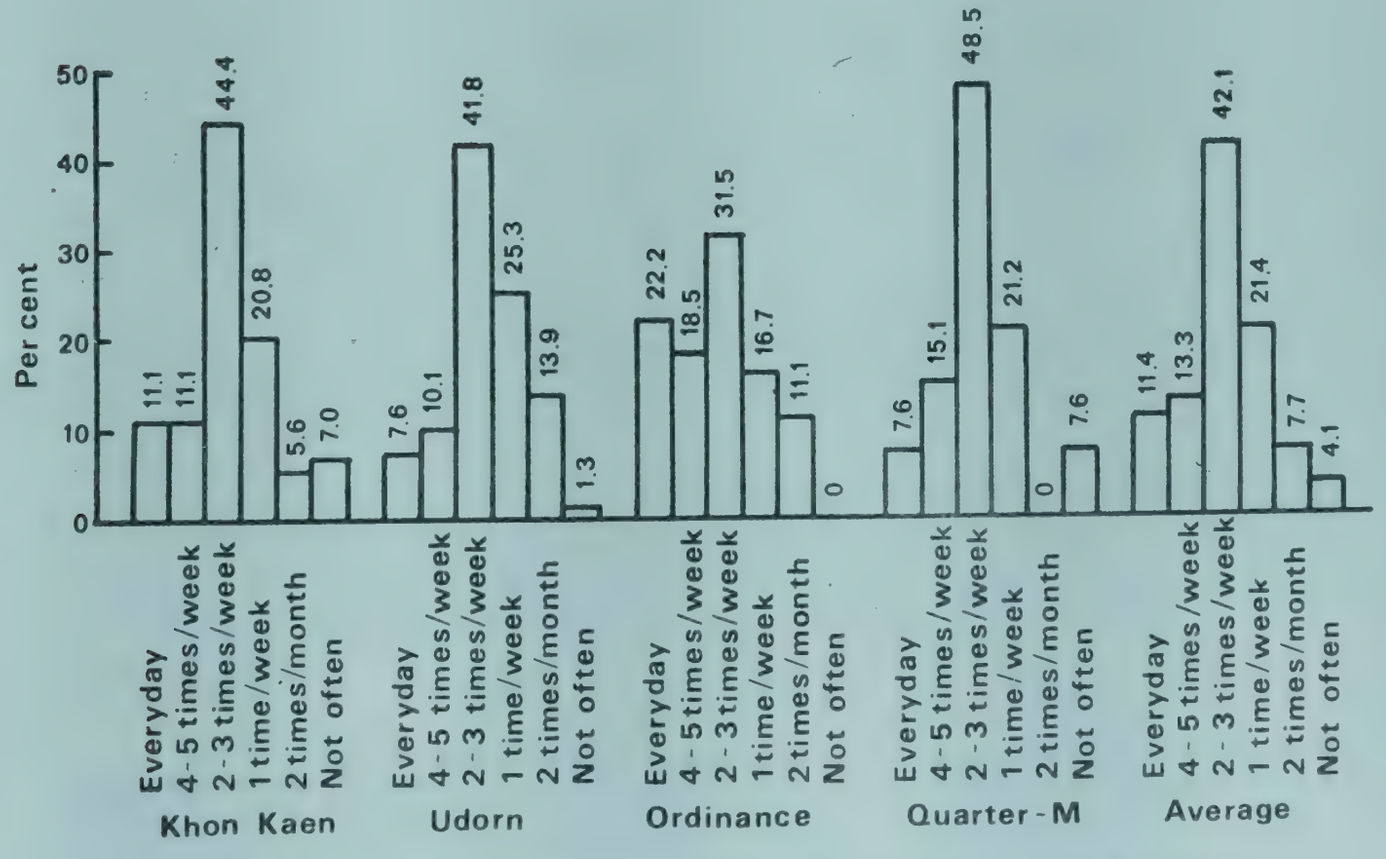



Chart 8 : Response to the question : "How often do you eat fish ?"

It is significant to note that "one time per week" responses are as high as 21.4 percent (Chart 8) which indicates that fish preparations may not be acceptable if it is to be tabled everyday or 4-5 times per week. This is possible because freshwater fish species usually require spices to deaden the "muddy" and other odors and the consumer needs to acquire skills in handling the "fish bones".

While some species of fish are considered delicacies and have become highly sought after...they still require time and skills in eating in order to avoid being stabbed by fish bones.

However, inland consumers of wild-type indigenous Thai fish will remain limited to catfish, snake heads, eels and a few other hardy species which have become specialized to the wet and dry conditions of Northeast and Central Thailand through "hibernating" ability. Pelagic fish species are limited to those areas which have permanently impounded or running water...which is now artificially stocked by the Department of Fisheries.

At the same time it should be understood that certain cultural or beliefs are still attached to the consumption of non-indigenous species of fish...especially in Northeastern Thailand. In certain areas it is "taboo" or "forbidden" for expecting and lactating mothers to eat certain species of fish...especially those species introduced by the Department of Fisheries, because it is believed to cause disfiguration of the womb-bound child and infants, as well as, the destruction of the mother's health.

Thus, the response to the question: "If the price of fish is lower, would you eat more fish?" may be conditioned, in part, by age-old beliefs (Chart 9).

As can be seen, from Chart 9, the dominant response is "Yes" in the case of Khon Kaen (55.6%) and the Quarter Master's Department (72.7%). However, the dominant response is "No" in the case of Udorn Thani (67.1%) and the Ordinance Department (61.1%) and the average favours "No" by 50.2%.

However, the socio-economic background of the tasters (see Chapter II) indicates the possiblity of a natural bias from their "fixed income" family background in the military and civil services. Thus, Chart 9 indicates that "price" is not the only factor influencing the selection

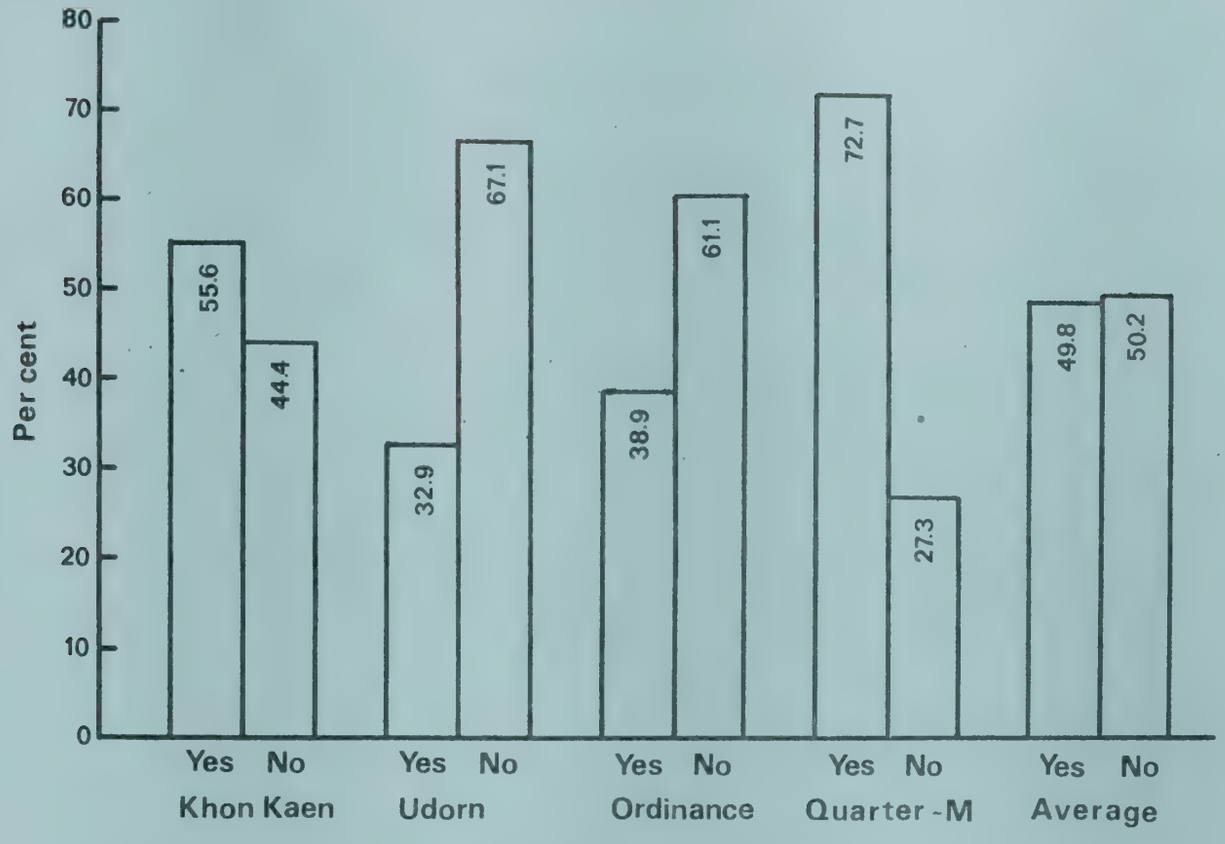



**Chart 9 : Response to the question : " If the price of fish is lower, would you eat more fish ? "**

of fish for increased consumption in these tasters' families/situations.

It is also apparent that the majority of tasters consider fish of equal quality to other meats or better than other meats (see Chart 10) while only a very small percentage view fish as inferior to other meats (averaging only 11.1%).

It should be noted that Udorn Thani and Quarter Master Department tasters registered the highest percentage for the view that "other meats are better than fish", respectively 16.4% and 15.1 %. However, their "quality" perception may be based upon non-nutritive considerations, such as palatability and variety of preparations possibility...including the "keeping quality" of raw fresh fish versus that of pork, beef and chicken.

Thus, jumping to conclusions must be avoided at this stage of acceptability testing...which may have insufficient "sensitivity" built

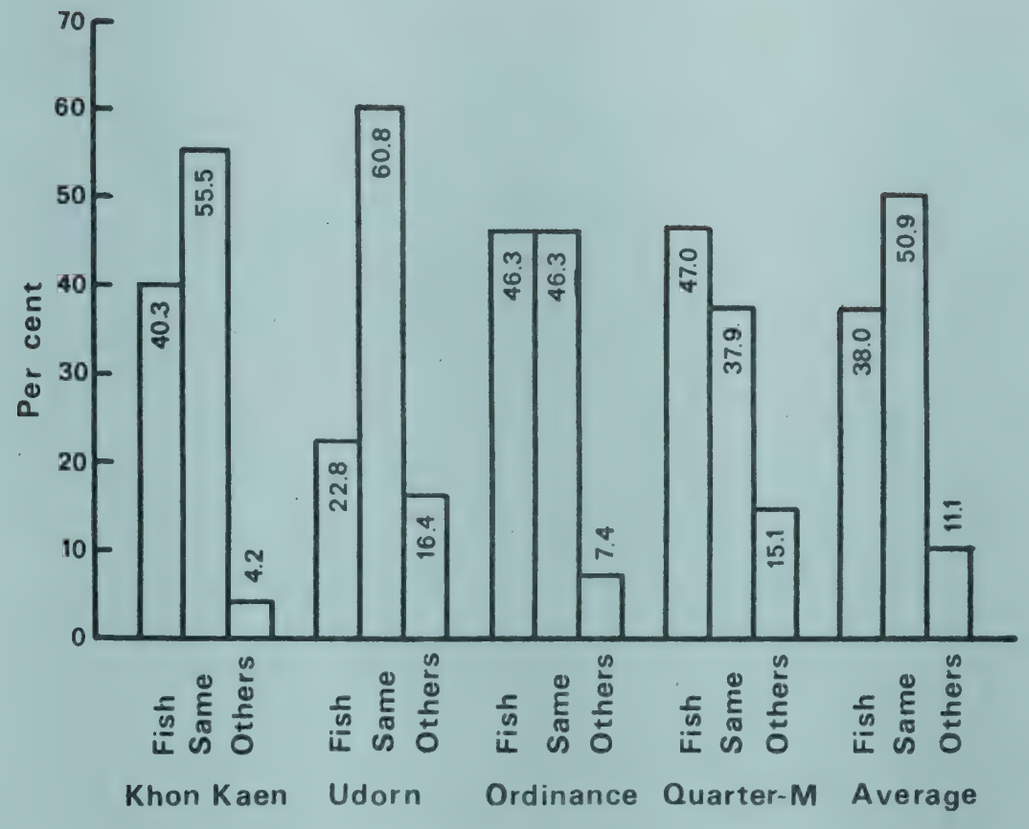



Chart 10.A : Response to the question : Compare the food quality of fish with other meats.... "Do you think that fish is better, the same as other meats, or other meats are better?..." by Provinces.

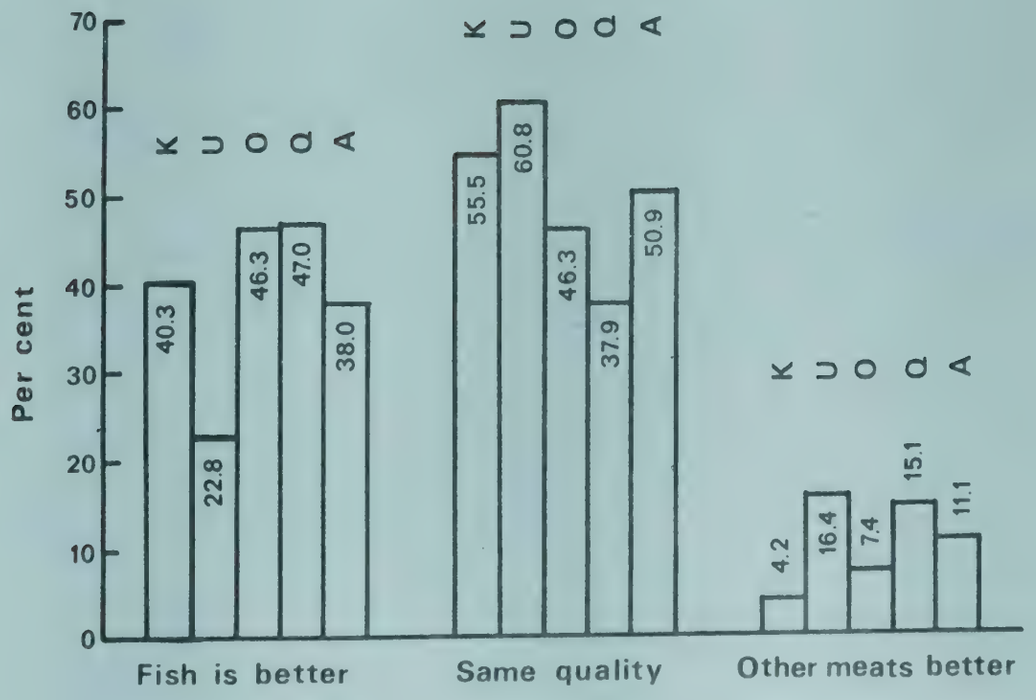



Chart 10.B : Response to the same question as in 10.A.... by answer grouping.

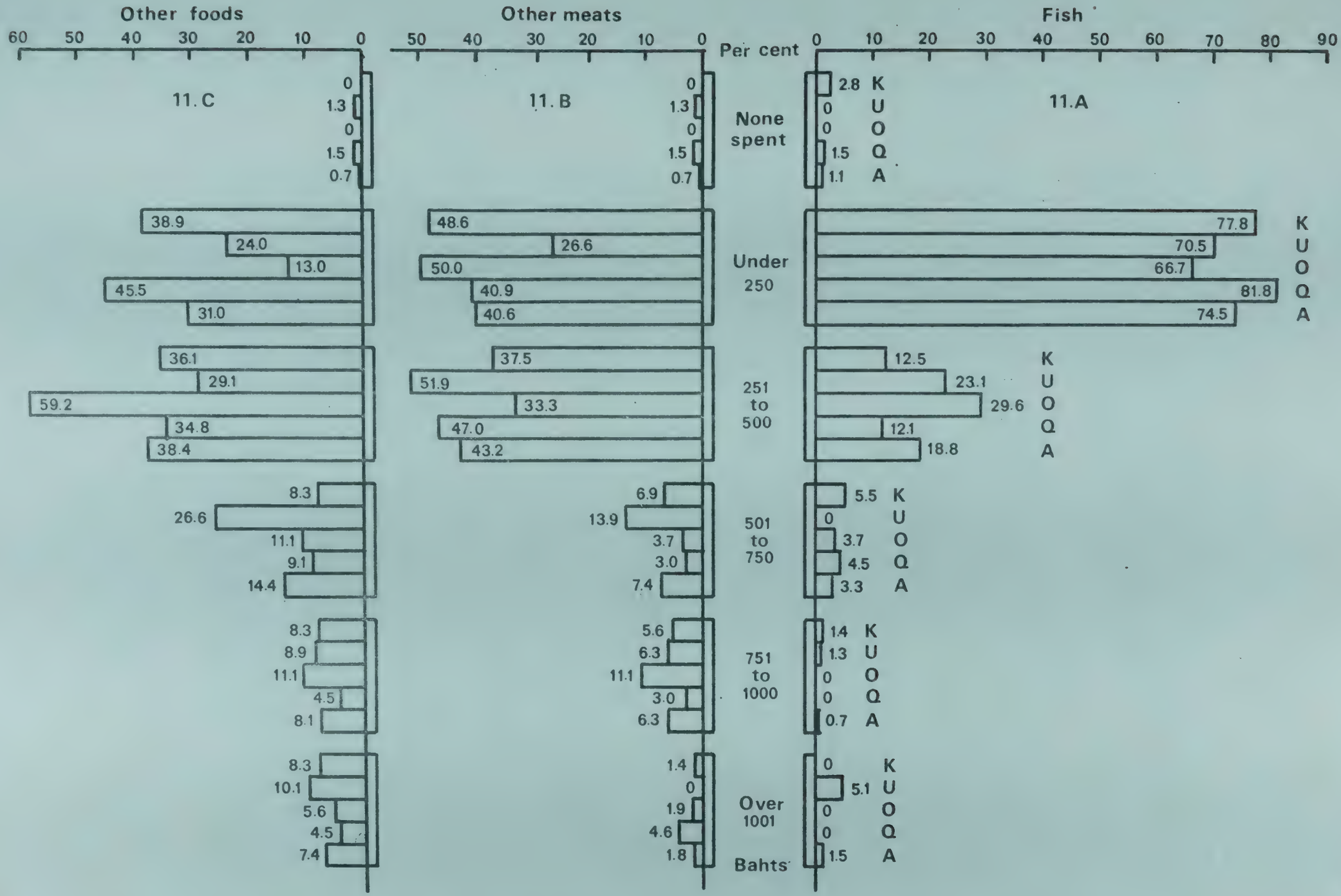



Chart 11 : Response to the question on family expenditure for; (11.A) Fish, (11.B) Beef, chicken, duck, and (11.C) Others (rice, vegetables, eggs, etc.) per month according to expenditure groups.

into the questions posed.

Chart 11 indicates that these under Baht 5,000 per month income families spend less than Baht 250 per month on fish for meal preparation (74.5% average) while Baht 251-500 per month (each) will be spent on other meats (43.2% average) and 38.4% average on other food items (rice, vegetables, eggs, etc.).

At the same time Chart 12 indicates that non-food expenses are, on the majority, under Baht 1,000 per month. Thus, the total majority of expenses might be under Baht 250 for fish, not over Baht 500 for other meats, not over Baht 500 for other food items and not over Baht 1,000 for other non-food items...for a total of "not over" Baht 2,250 expenditures for food and non-food items.

This leaves Baht 2,750 for other expenses including education, transportation, rents, and medical treatment. Thus, leaving very little economic lee-way for these tasters and their families...especially if the PP and RDF prices are beyond an "acceptable" range.

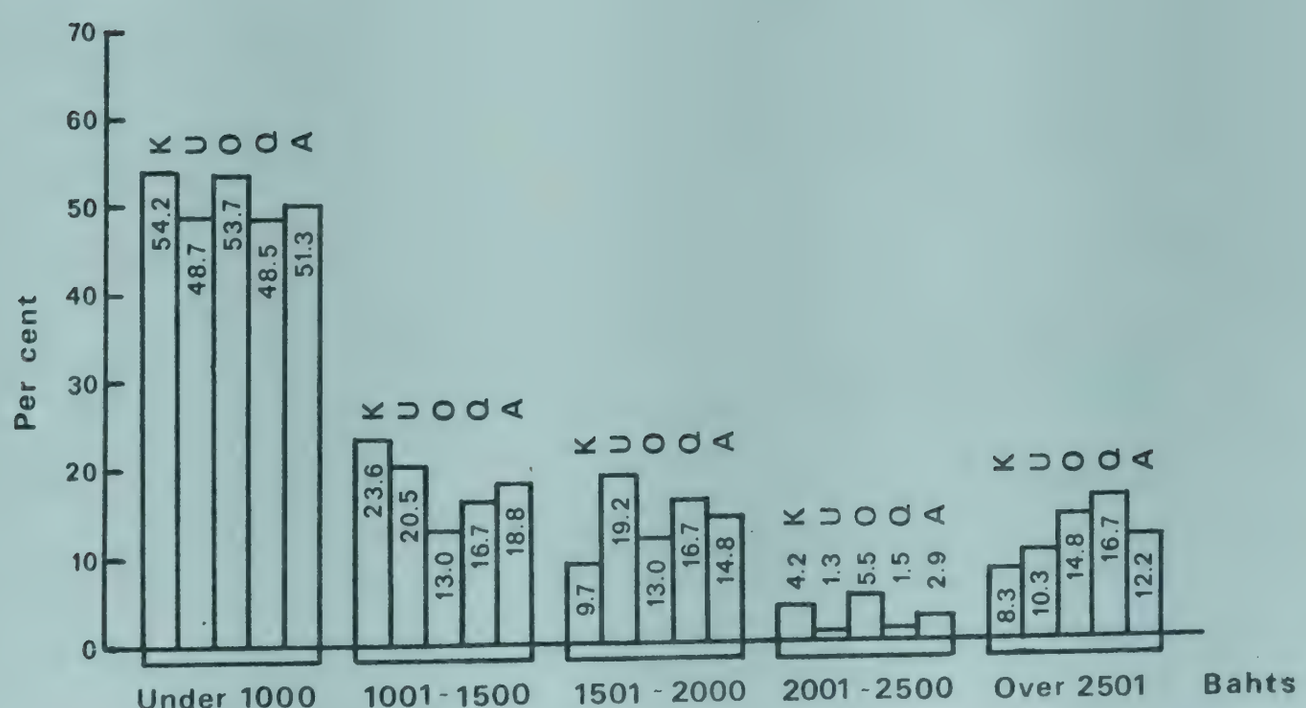



Chart 12: Response to question on family expenditure for non-food items, per month, according to expenditure groups.

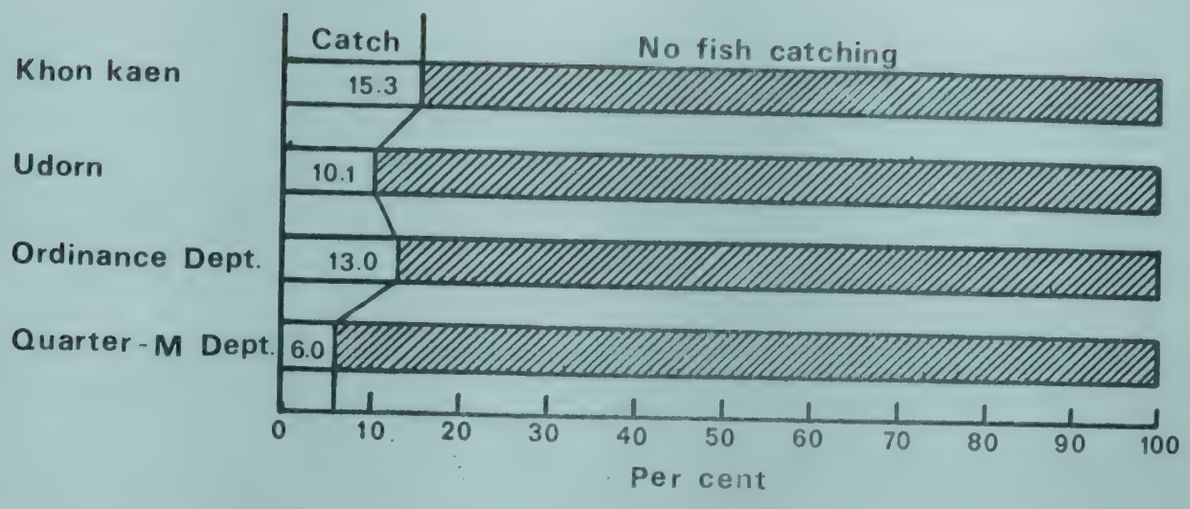



Chart 13: Proportion of families catching fish for consumption, per month of each sample group.

It is important to note that "alternatives" are limited for these taster families especially the means for acquiring self-caught fish which is limited to a maximum of 15.3 percent in Khon Kaen and 6.0 percent in the Bangkok based Quarter Master Department (see Chart 13).

However, the "alternatives" as far as collecting or producing part of their food needs is much higher for the rural based tasters (Khon Kaen/52.8% and Udorn Thani/53.2%) while Bangkok based tasters experience lower collection/production possibilities (Ordinance Dept./ 27.8% and Quarter-Master Dept./18.2%), see Chart 14.

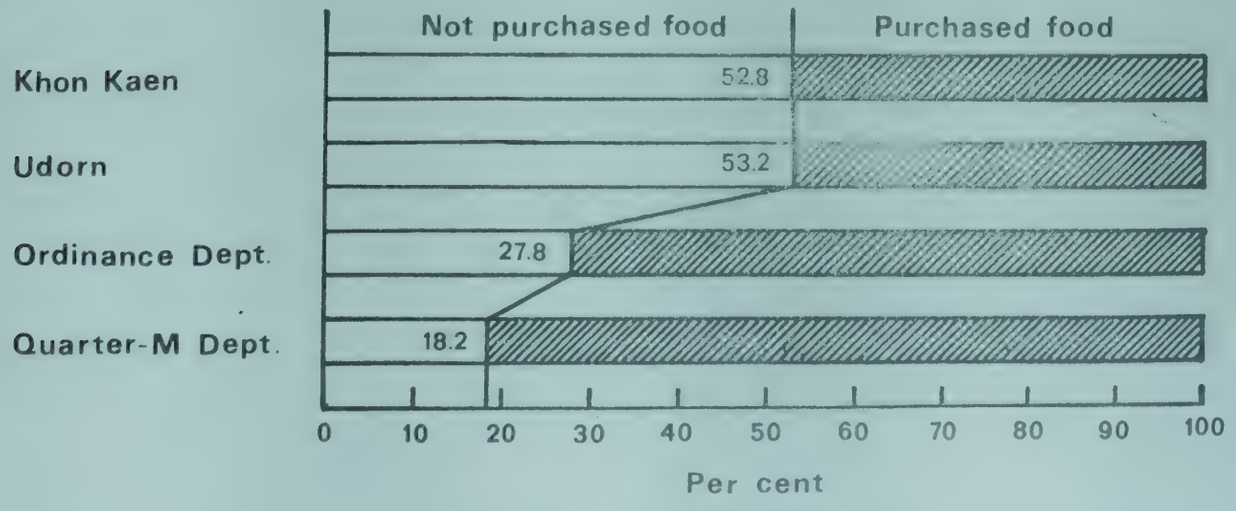



Chart 14: Proportion of families collecting or producing their food needs, per month of each sample group.

The ability to collect/produce a proportion of family food needs is dependent upon the availability of land and time. It is doubtful that the Bangkok based tasters will have access to a plot of land suitable for a kitchen-garden, nor will they have the time to take care of such gardens because of economic constraints and commuting time between homes and work place.

However, the rural based tasters may be provided with government housing which could include a small plot of land suitable for developing into kitchen garden and chicken housing. Also, since their work place and housing unit will most likely be in close proximity, it is very likely that they will spend very little time commuting...thus having daily allocations of time for own production/collection of food items.

## IV.2 ACCETABILITY OF RDF

Based upon tests and calculations of Absolute Index and Relative Index described in Phase I of this Acceptability Testing Series, titled..."*Report on the Acceptability Testing of Fish Protein Concentrate'Type B and Roller-Dried Fish in Thailand*" by Bulan Phithakpol, Sukoncheun Sringam, Noi Sarikaputi and Theodore Panayoton, published by the Food and Agricultural Organization of the United Nations and the Institute of Food Research and Product Development, Kasetsart University, Bangkok, May 1981...this Phase II Report yielded the following results:

Table 2 RDF acceptability ranking.

| Type of Acceptability | RDF Ranking (Choice) | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th |
| *Physical Acceptability* | | | | |
| Based upon taster group's geographical station | Tau-chiew-lon | Nam-prik-pla-ra | Pla-ra-song-krueng Hoh-mok | - |
| Based upon preparation dish dominance | Tau-chiew-lon | Nam-prik-pla-ra | Pla-ra-song-krueng | Hoh-mok |
| *Economic Acceptability* | | | | |
| Averaged values | Kai-jiew-pla-pon | Nam-prik-pla-ra | Pla-ra-song-krueng | Hoh mok |
| Combined Average Value/Choice | Mixed Choice | Nam-prik-pla-ra (First) | Pla-ra-song-krueng (Second) | Mixed choice |

It can be seen that RDF (made in Thailand) achieved clear-cut acceptability as actual First and Second Choice overall even though they are Second and Third Choices, respectively, based on only physical acceptability or economic acceptability. (see Appendix B, B.1 for details).

Thus, overall, Nam-prik-pla-ra and Pla-ra-song-krueng are ahead of Tau-chiew-lon and Hoh-mok and far ahead of Kai-jiew-pla-pon (see Table 2).

This is partly confirmed in Chart 15 which indicates the choice of food preparations that housewives would repeat if RDF was made available in packages of 25 gms. at Baht 2.50. But Chart 15 also indicates that Tau-chiew-lon is a bit ahead of Pla-ra-song-krueng, but far behind Nam-prik-pla-ra.

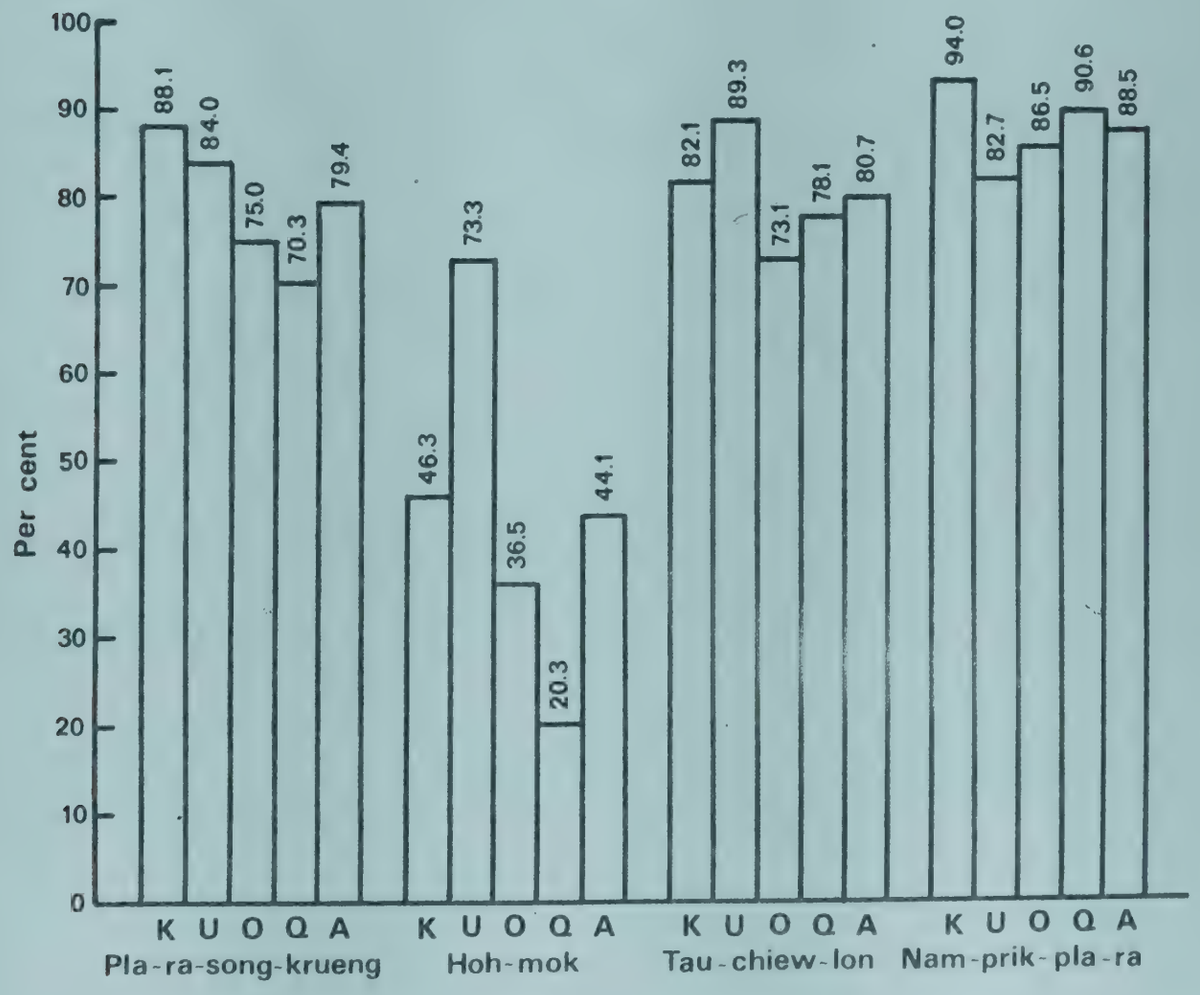



Chart 15 : Food preparation choices with 25 gms-packets of RDF at Baht 2.50 each.

A further emphasis on acceptance of RDF appears in Chart 16 where the housewives propose 2-3 times per week frequency in utilization if the portions are Baht 2.50 in price.

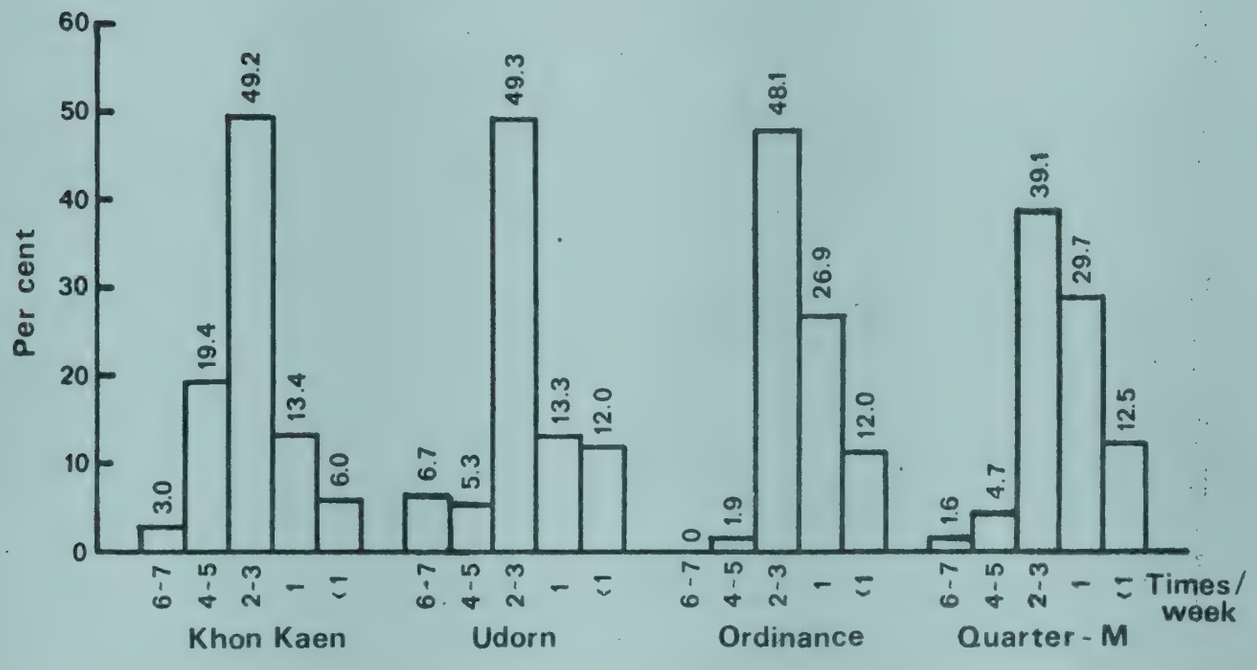



**Chart: 16 Housewives' proposed frequency of preparing foods with RDF purchased in Baht 2.50 portions of 25 gms.**

## IV.3 ACCEPTABILITY OF PP

On the other hand, based upon the dishes used to test PP (made in Thailand) it appears that the choices are different (see Appendix C, C.1 for details), as follows:

Table 3 PP acceptability ranking.

| Type of Acceptability | PP Ranking (Choice) | | | |
|---|---|---|---|---|
| | 1st | 2nd | 3rd | 4th |
| *Physical Acceptability* | | | | |
| Based upon taster group's geographical station | Kaeng-som | Pla-ra-song-krueng | Kai-jiew-pla-pon | Hoh-mok |
| Based upon preparation dish dominance | Kaeng-son | Kai-jiew-pla-pon | Pla-ra-song-krueng | Hoh-mok |
| *Economic Acceptability* | | | | |
| Average Values | Kaeng-som | Kai-jiew-pla-pon | Pla-ra-song-krueng | Hoh-mok |
| Combined Average Value/Choice | Kaeng-som (First) | Mixed Choice | Mixed Choice | Hoh-mok (Second) |

PP presented as Kaeng-som achieved clear-cut first choice in physical economic and combined average with Hoh-mok achieving second choice on the merit of being accepted as consistent 4th choice in physical, economic and combined average. This leaves Kai-jiew-pla-pon and Pla-ra-song-krueng in contention for overall third and fourth choices (see Table 3).

This is clearly presented in Chart 17 where Kaeng-som is the overall choice, whild Pla-ra-song-krueng is a strong second choice and Hoh-mok is a weak fourth choice.

A slightly softer acceptance of PP (compared to RDF in Chart 16) is displayed in housewives' proposed frequency of utilization of PP... as indicated in the percentage values for all tasters' groups, excluding the very high 54.7 percent of the Khon Kaen group (see Chart 18) which may also mean that PP is very acceptable in Kaeng-som and Pla-ra-song-krueng type preparations (see Chart 17).

However, it is still difficult to be convinced that the RDF and PP choices (rankings) for different preparations are as they appear.

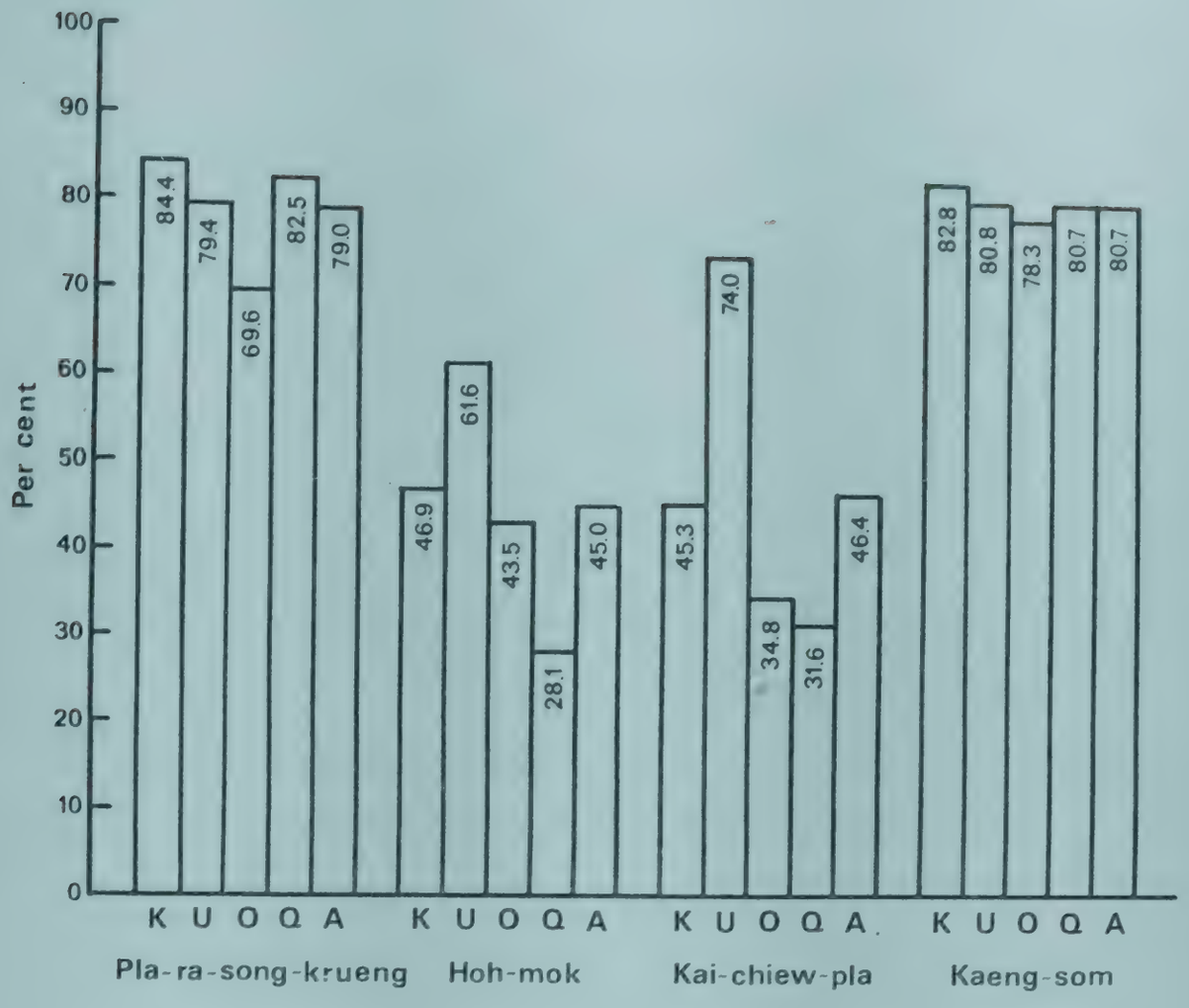



Chart 17: Food preparation choices with 40 gms. packets of PP at Baht 2.50 each.

Thus, it would appear that further acceptability testing is desirable to determine the following:

*In the case of RDF:* the acceptance of Tau-chiew-lon over Nam-prik-pla-ra and Pla-ra-song-krueng...physically and economically. At the same time the acceptability of Kai-jiew-pla-pon over Hoh-mok... in relation to the three dishes mentioned earlier.

*In the case of PP:* the acceptance of Pla-ra-song-krueng versus Kai-jiew-pla-pon and their relative status in comparison with Kaeng-som and Hoh-mok.

It should be noted that the colour, consistency, taste and smell of the various RDF and PP preparations are difficult to evaluate already due to the nature of the raw materials utilized in preparing each dish. Example: Kai-jiew-pla-pon is omelette with RDF or PP included. The raw materials are basically duck or chicken eggs laced with RDF or PP, which allows the colour, smell and consistency of the finished product to be strongly influenced by RDF and PP.

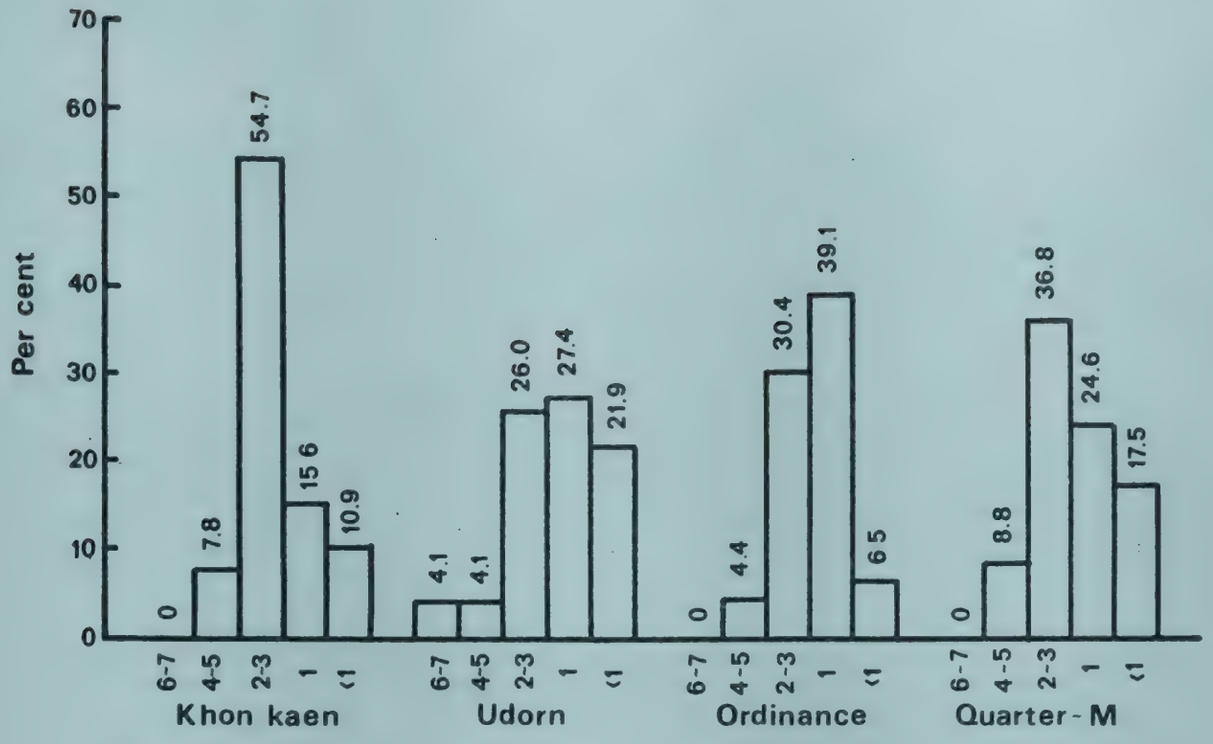



**Chart 18: Housewives' proposed frequency of preparing foods with PP purchased in Baht 2.50 portions of 40 gms.**

However, in the case of Hoh-mok, there are spices and other condiments which nullifies the colour and smell of PP and RDF. Yet, in the case of Kaeng-som, it is clear that traditional preparation and preparation with RDF or PP will cause very little change, thus it will be acceptable or less acceptable only because the "chef" has made it too salty, sour or chili-hot.

Thus, it can be concluded, at this stage, that in the direct comparison of the physical acceptability of RDF and PP (Pla-pon) the relative index of PP as Pla-ra-song-krueng dominates that of Hoh-mok. However, it should be noted that Udorn Thani tasters are the only group who displayed the relative index of PP as Hoh-mok dominating Pla-ra-song-krueng.

This, again, confirms the need for verification of taster's choice through the utilization of common food preparations which the middle and lower income people subscribe too.

The idea of mixing fish with eggs...Kai-jiew-pla-pon...is not common throughout Thailand. However, Kaeng-som, is wide-spread and utilize different vegetables and minced fish and shrimp to give it body. At the same time, the Bangkok phenomenon is Kanom-jeen Nam Ya...made with minced fish (to give the sauce body) and fish balls (to give it eye-appeal)...should be tested (although in Phase I a traditional Nam-Ya...without fish-balls...was rejected after pretest).

This might mean that menus will have to be designed for specific markets (consumers) and dividing them into dishes for Northeasterners, Northerners, Southerners and others...plus for rural and up-country cities and Bangkok Metropolis inhabitants...in order that a Pre-Feasibility for Marketing is established on a broad base.

This is because the Bangkok inhabitant is probably more cosmopolitan, but will favour dishes prepared in the tradition of their home-towns. The up-country city inhabitants will be less cosmopolitan, if they have migrated from rural areas, but the cosmopolitan width will be limited to only a narrow group.

Thus, in conclusion, it is suggested that it should be desirable to establish a broader Pre-Marketing test base...perhaps utilizing factory workers and rural villagers in at least 20 selected Distric level locations throughout the four main geographical areas of Thailand...and should avoid including just the Muang District of any selected province.

As for Bangkok Metropolis it is desirable to test the acceptability of factory workers and groups of people who visit Department Stores (without mention of incomes) asking only for home-towns and present home-town and occupation.

However, this can only be conducted with a more liberal allocation of financial resources and the assistance of technical (market feasibility) expertise assigned by FAO...plus a time schedule which is adequate enough to take in the seasonal variations of food consumption. Details will have to be discussed and worked out in the design for Phase III (Pre-Feasibility for Marketing Nationally).

# CHAPTER V: CONCLUSION AND RECOMMENDATIONS

*"Food aid issues are highly interrelated. Inevitably, discussions about food aid touch on most of the major development and welfare issues facing developing countries."*

*Gordon O. Nelson (1980)*

## V.1 CONCLUSION:

It is important that sources of proteins are utilized in a manner which assists the development of human resources to levels where they are productive and creative units contributing to the betterment of their own lives and environment.

Thus, the quest for vegetable based proteins (especially soybean and other beans) has continued through the ages and, in the Asian tradition, China leads in the utilization of soybeans as a protein source.

However, animal based proteins appear to be of wider acceptance to palates so that milk, eggs and the flesh of domestic species of animals (pigs, chickens, ducks, geese and cattle) have become widely sought after.

But, in order to produce large quantities of these vegetable based proteins requires agricultural techniques and inputs, which includes the proper type of Rhizobium to assist in the fixation of free-Nitrogent to form the basic Amino Acids and Proteins. Most of all it requires a soil which has adequate supplies of organic matter (often supplied by animal manure) and inorganic nutrients (fertilizers of N, P and K plus trace elements composition).

At the same time another animal based protein resource is that found in Marine fish and animals. Some of these have acquired high consumer demand status (and high prices) especially the fast swimming oceanic tuna and the scavenger shrimps.

However, there are species of demersal and pelagic fish which are caught by demersal "other-board" trawls which are too small to be considered of commercial value as "table fish"...yet are full of precious proteins.

The utilization of these "too small" fish are, therefore, considered "trash fish" and sometimes thrown back into the sea in order to allow space for valuable "table fish". However, these "trash fish" soon found itself being utilized raw as animal feed. The red coloured species of fish catching the eye of Ban-Don, Suratthani Province egg producing ducks...and yielding bright red egg yolks. The silvery species being favoured by the meat producing ducks of Cholburi Province. All other "trash fish" being utilized as fish feed (mixed with rice bran and broken rice) in the cultivation of catfish and snake heads of Suphanburi and Nakorn Sri Thammarat Provinces.

A larger portion of "trash fish" could not be utilized raw or kept in that form for a long time, thus becoming "fish meal" or "pla pon" of feed quality. This method of handling developed into industrial scale as the poultry industry of Thailand took on an integrated and export oriented nature.

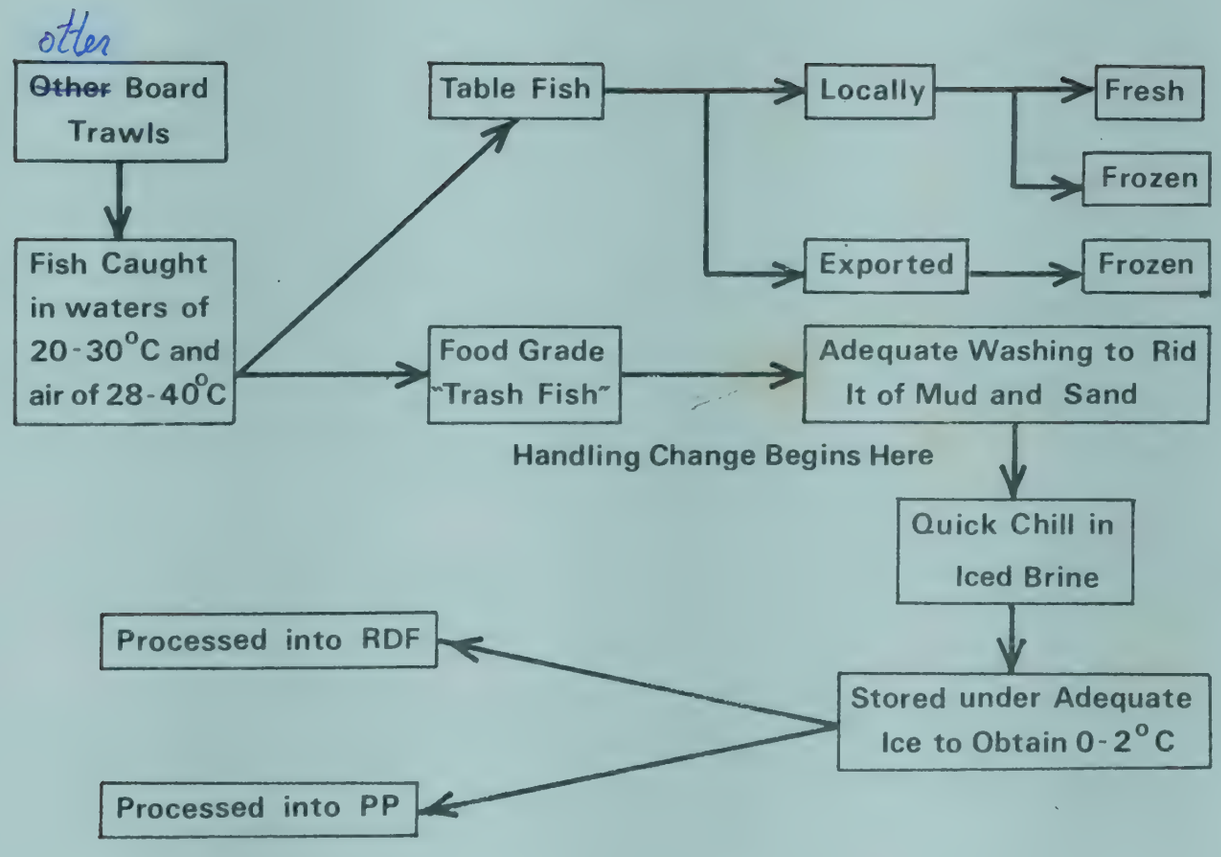
Fryers and eggs of special breeds of chickens utilized, at the beginning, fish meal imported from Peru. However, the introduction of the German otter-board trawl supplied large quantities of "trash fish" which became the source of local supplies of "fish meal" of feed quality... and as mentioned in earlier chapters does not meet health specifications of Thailand, as far as direct human consumption is concerned.

## V.2 MAKING A STRATEGIC POLICY CHOICE

Thus, leaving Thais with a choice... to leave "trash fish" in "animal feed only " criteria or to attempt to raise it to "human food" standards...which implies catch handling changes presented in Flow Chart 3.

However, the cost of the well chilled and iced "trash fish" will be much higher than the Baht 2.55/kg. indicated by Flow Chart 2 of Chapter III...which will result in a higher per kilogram price for PP and RDF.

But increased prices may remain acceptable if there is a policy to subsidise PP and RDF purchases for distribution to refugees and the poor who have protein status problems. Yet such subsidies cannot last forever because no government and no aid agency is capable of long-term subsidy arrangements. Thus, it would mean that Thai




Flow Chart 3 : Showing what has to be done to produce "Food grade" trash fish of mass production of RDF and PP from Thai marine catch.

efforts must function under "real" market forces and conditions.

## V.3 RECOMMENDATIONS:

Therefore, the production of PP and RDF must be dependent upon a high level of acceptance by consumers with "high" social, economic and educational status. This, therefore, implies that FAO/NORAD must seriously consider testing the acceptability of PP and RDF amongst the Thai elite.

PP and RDF must no longer be associated with the poor and the low quality "trash fish" called "pla ped" (fish for the ducks). It must have the blessings of the educated class of people who are seeking to build a better Thailand, it must have the attractiveness which politicians can utilize profitably in garnering votes from constituents, and it must provide incomes for whole-salers and retailers who would be distributing the products.

Perhaps the best strategic approach is for PP and RDF to be packaged and distributed as "ready mix" instant stock for the popular "kaeng-som, nam-prik-pla-ra and pla-ra-song-krueng". Such fully seasoned "ready mix" ...just add water and/or vegetables and bring to a boil. ...instant foods are becoming a part of Bangkok life...and has filtered through to unskilled labourers who have worked in Bangkok.

It is probably wise to bring in the promoters of "instant" noodles... which is now available in the rural areas.

But, "the poor and nutritionally needy" will still not have access to PP and RDF proteins...which is true. However, it is fashionable to contribute towards school lunches, monasteries where orphans are raised, and to villages in remote areas. Thus, it is possible to "guide" merit makers into choosing PP and RDF products (which they know and like) for contributing to charity...including to refugees.

This puts the subsidy burden into the hands of "volunteers" and is in part, covered by commercial scale sales and promotion costs of producers.

The key element to such a programme's initiation will, however, be the identification of menus utilizing PP and RDF which will be acceptable to a wide cross-section of people in the cities and rural environment. In order to be able to obtain such results the IFRPD will need the full support of FAO/NORAD...especially in terms of experimental budget and, possibly, expert participants to assist in designing, conducting and evaluating the experiment and results of acceptability testing.

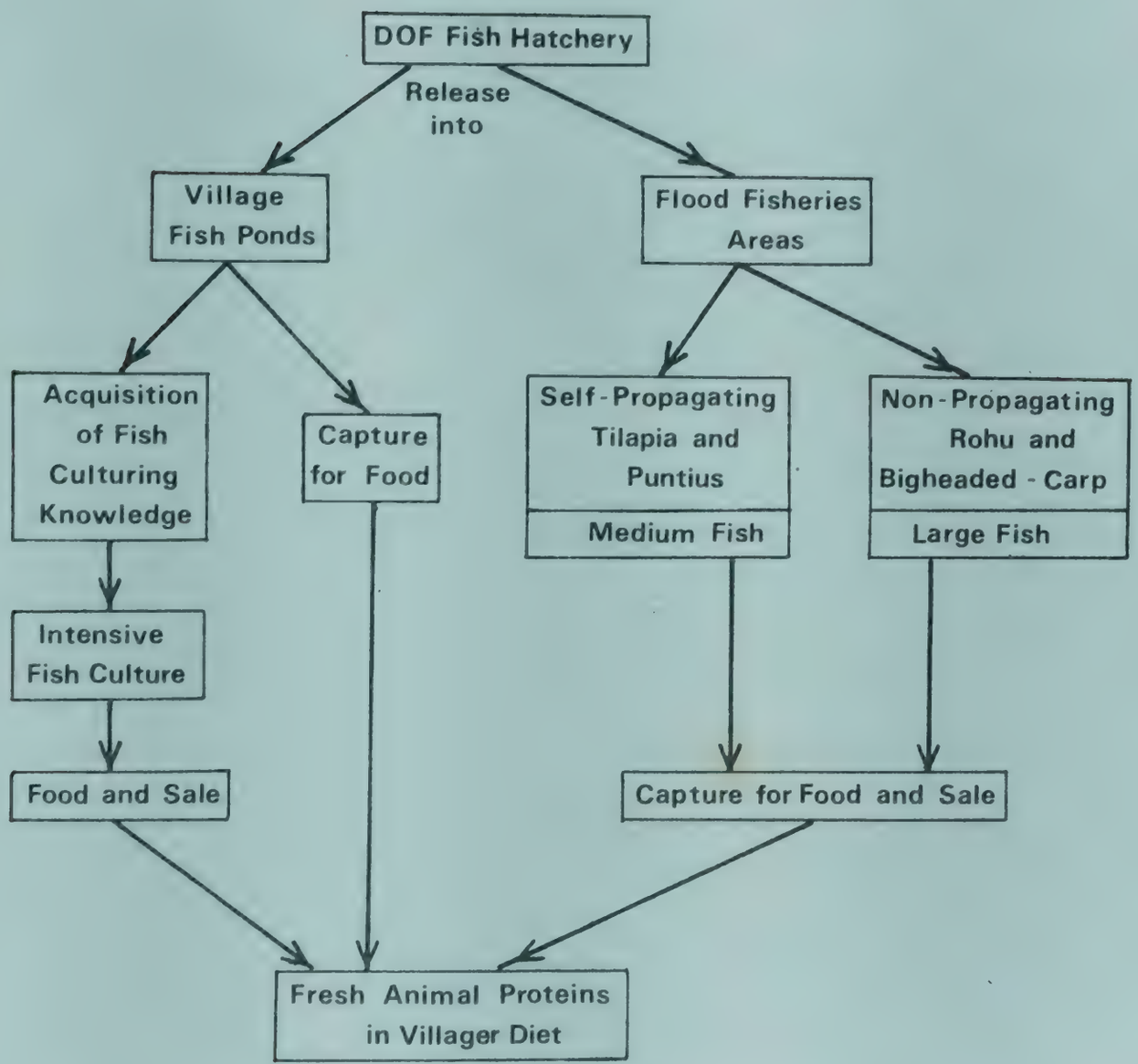
## V.4 SUPPLEMENTAL PROGRAMME:

At the same time FAO/NORAD should become aware of the Thai Department's Village Fish Ponds programme (initiated in 1980 with grant-aid from the USAID) and the programme to stock naturally flooded areas with fingerlings so that the poorest people in Thailand may have access to fresh-fish. The funds comes from the National Budget in combination with technical know-how acquired in the Canadian Government Funded Freshwater Fisheries Institute and the "fish fry production centers" built with National Budget and Japanese Grant Aid.

Such a program, although initiated widely in 1982, has shown better than expected results through public participation from inception to harvesting procedures. But the key has probobly been the selection of Tilapia, puntius, rohu and bighead carp for stocking fish ponds and flood fisheries areas. These four species do not need to be fed and Tilapia is a prolific mouth breeder, thus assuring that the poor villagers will have access to fish.

Although the Department of Fisheries' programme will not provide fish (or live proteins) year round, it does provide some protein while the PP and RDF matures to the full implementation stage. Thus, the Department of Fisheries' programme and the FAO/NORAD programme with PP and RDF are complimentary.

Also, the complementation will continue to be necessary because the four groups of tasters have indicated a high preference for fish in "chunks" (see Chart 7 in Chapter IV).




Flow Chart 4 : The complementary fish releasing programme of the Thai Department of Fisheries.

Therefore, it is highly recommended that the FAO/NORAD considers the implementation of a programme similar to that of the Thai Fisheries Department in complementation with the introduction of PP and RDF products in other countries where water resources and fish consumption practices are available and acceptable.

REFERENCE LIST

ASRCT and UNIDO, Survey of the Fish Processing Technologies in Thailand, Bangkok, February 1978.

ESCAP, United Nations, Population of Thailand:Country Monograph Series No. 3, (Bangkok:1976).

IBRD, Thailand: Toward a Development Strategy of Full Participation, A Basic Economic Report, (Wash. D.C.:Sept. 1,1978).

Meesook, Oey Astra, *A Study of Disparities in Income and Social Services Across Provinces in Thailand,* (Thammasat University Research Report Series No.7, Faculty of Economics, Sept. 1978).

Mellor, John W., *Food Aid and Nutrition,* American Journal of Agricultural Economics, Vol.62, No.5, December 1980, Proceedings Issue.

Nelson, Gordon O., *Improving the Effectiveness of Food Aid,* A Seminar Report Monograph Food Aid and Development, Agricultural Development Council, New York, 1980.

NSO, *Household Income and Expenditures Survey, 1975/76,* Bangkok.

## APPENDIX A.

## DESCRIPTION OF RECIPES

### *Kaeng som* (Sour bamboo shoot)

**Ingredients**

| | |
|---|---|
| chilli paste for Kaeng som | 60 gm |
| sour bamboo shoot | 300 gm |
| tamarind pulp | 60 gm |
| coconut sugar | 30 gm |
| fish sance | 4 tablespoon |
| RDF | 18 gm or FPC 30 gm |

**Procedure**

1. Boil about 4 cups of water
2. Mix in chilli paste, reboil
3. Add RDF or FPC, sour bamboo shoot
4. Season with coconut sugar, tamarind pulp and fish sauce.

Note: Normal Kaeng-Som has "chunks" of fish included, but in this Sampling Sequence no "chunks" of fish are included in order to focus directly up PP and RDF.

### *Nam-prik-pla-ra*

**Ingredients**

| | |
|---|---|
| fermented fish | 50 gm |
| green pepper | 70 gm |
| garlic | 30 gm |
| shallot | 30 gm |
| lime juice | 2 tablespoon |
| fish sauce | ½ teaspoon |
| RDF | 10 gm or PP 30 gm |

**Procedure**

1. Boil fermented fish with 1 cup of water until soft.
2. Strain over a strainer, use only the juice.
3. Grill green pepper, garlic, shallot, ground coarsely.
4. Bring the fermented fish juice to boil, stir in RDF or FPC remove from stove.
5. Add ground mixture, season with lime juice, fish sauce
6. Serve with fresh vegetables.

*Pla-ra-song-krueng*

Ingredients

| | |
|---|---|
| fermented fish | 200 gm |
| shredded coconut meat | 240 gm |
| lemon grass | 10 gm |
| shallot | 10 gm |
| wild ginger | 20 gm |
| green pepper | 10 gm |
| yard long bean | 100 gm |
| egg plants | 100 gm |
| bamboo shoot | 100 gm |
| bitter orange leaves | 100 gm |

RDF 30 gm or FPC 40 gm

Procedure

1. Boil fermented fish with ½ cup of water until soft.
2. Strain, use only the juice.
3. Prepare coconut milk with 1 cup of water.
4. Wash lemon grass, shallot and wild ginger, slice.
5. Wash yard long beans, egg plants and bamboo shoot, cut into pieces.
6. Boil coconut milk with fermented fish juice.
7. Add bamboo shoots, egg plants and yard long beans in order.
8. Add wild ginger, shallot and lemon grass, remove from stove.

Note: Normal Pla-ra-song-krueng has "chunks" of fish included, but in this Sampling Sequence no "chunks" of fish are included in order to focus directly up PP and RDF.

*Tau-chiew-lon*

Ingredients

| | |
|---|---|
| fermented soy bean | 100 gm |
| shredded coconut meat | 180 gm |
| shallot | 60 gm |
| coconut sugar | 60 gm |
| tamarind pulp | 35 gm |
| red pepper | 10 gm |

RDF 30 gm or FPC 80 gm

Procedure

1. Pound fermented soy beans into paste.
2. Prepare coconut milk with 1 cup of water.
3. Squeeze tamarind pulp with a little coconut milk.
4. Boil coconut milk, add fermented soy bean paste, boil again.
5. Add RDF or FPC.
6. Season with coconut sugar, Tamarind slurry.

*Kai-jiew-pla-pon*

Ingredients

dusk eggs 2 egg

RDF 10 gm or FPC 20 gm

fish sauce, black pepper

frying oil

Procedure

1. Best egg until foam.
2. Add RDF or FPC, season with fish sauce and black pepper.
3. Fry in hot frying oil, turn over until brown on both sides.

*Hoh mok*

Ingredients

chilli paste for Hoh mok 60 gm

duck eggs 2 eggs

cabbage 120 gm

shredded coconut meat 240 gm

fish sauce 2 tablespoon

red pepper, parsley and bitter lemon grass

RDF 30 gm or FPC 90 gm

Procedure

1. Prepare thick coconut milk (about 1½ cups).
2. Wash cabbage, cut into chunk, scorch and drain.
3. Stir chilli paste in coconut milk.
4. Stir in duck egg until well mixed, add RDF or FPC and fish sauce.
5. Lay the cabbage on the bottom of banana leaf bowl, cover with the chilli mixture.
6. Steam for 10 minutes, cover with coconut cream parsley shredded red pepper, shredded bitterlemon grass steam for another 5 minutes.

*Hoh Mok*

*Note:* Normal Hoh Mok has "chunks" of fish included, but in this Sampling Sequence no "chunks" of fish are included in order to focus directly up PP and RDF.

## Apendix B

### Physical Acceptability Index of Roller Dried Fish

| Acceptability index | Khon Kaen | | | | | Udorn | | | | | Ordinance Department | | | | | Quartermaster's Department | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | PJa-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age |
| A. Color | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.692 | 0.767 | 0.709 | 0.724 | 0.723 | 0.750 | 0.831 | 0.787 | 0.736 | 0.776 | 0.717 | 0.701 | 0.625 | 0.750 | 0.698 | 0.700 | 0.723 | 0.702 | 0.810 | 0.734 |
| -rank | 15 | 4 | 11 | 8 | | 5 | 1 | 3 | 7 | | 10 | 13 | 16 | 5 | | 14 | 9 | 12 | 2 | |
| Absolute index of RDF | 0.661 | 0.580 | 0.716 | 0.724 | 0.670 | 0.645 | 0.695 | 0.790 | 0.666 | 0.699 | 0.598 | 0.622 | 0.567 | 0.660 | 0.612 | 0.529 | 0.519 | 0.702 | 0.742 | 0.623 |
| -rank | 8 | 13 | 4 | 3 | | 10 | 6 | 1 | 7 | | 12 | 11 | 14 | 9 | | 15 | 16 | 5 | 2 | |
| Relative index of RDF | 0.955 | 0.756 | 1.010 | 1.000 | 0.927 | 0.860 | 0.836 | 1.004 | 0.905 | 0.901 | 0.834 | 0.887 | 0.907 | 0.880 | 0.877 | 0.756 | 0.718 | 1.000 | 0.916 | 0.849 |
| -rank | 5 | 14 | 1 | 3 | | 11 | 12 | 2 | 8 | | 13 | 9 | 7 | 10 | | 14 | 16 | 3 | 6 | |
| B. Consistency | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.759 | 0.806 | 0.742 | 0.761 | 0.767 | 0.671 | 0.890 | 0.814 | 0.750 | 0.781 | 0.728 | 0.696 | 0.784 | 0.810 | 0.754 | 0.712 | 0.742 | 0.698 | 0.825 | 0.744 |
| -rank | 8 | 5 | 10 | 7 | | 16 | 1 | 3 | 9 | | 12 | 15 | 6 | 4 | | 13 | 10 | 14 | 2 | |
| Absolute index of RDF | 0.746 | 0.500 | 0.761 | 0.735 | 0.686 | 0.628 | 0.708 | 0.801 | 0.672 | 0.702 | 0.647 | 0.627 | 0.683 | 0.660 | 0.654 | 0.496 | 0.535 | 0.663 | 0.702 | 0.599 |
| -rank | 3 | 15 | 2 | 4 | | 12 | 5 | 1 | 8 | | 11 | 13 | 7 | 10 | | 16 | 14 | 9 | 6 | |
| Relative index of RDF | 0.983 | 0.620 | 1.026 | 0.966 | 0.894 | 0.936 | 0.796 | 0.984 | 0.896 | 0.899 | 0.889 | 0.901 | 0.871 | 0.815 | 0.867 | 0.697 | 0.720 | 0.950 | 0.851 | 0.805 |
| -rank | 3 | 16 | 1 | 4 | | 6 | 13 | 2 | 8 | | 9 | 7 | 10 | 12 | | 15 | 14 | 5 | 11 | |
| C. Taste | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.790 | 0.856 | 0.761 | 0.675 | 0.770 | 0.724 | 0.916 | 0.895 | 0.605 | 0.785 | 0.783 | 0.750 | 0.846 | 0.850 | 0.807 | 0.817 | 0.762 | 0.758 | 0.829 | 0.792 |
| -rank | 8 | 3 | 11 | 15 | | 14 | 1 | 2 | 16 | | 9 | 13 | 5 | 4 | | 7 | 10 | 12 | 6 | |
| Absolute index of RDF | 0.746 | 0.517 | 0.754 | 0.653 | 0.668 | 0.622 | 0.669 | 0.794 | 0.463 | 0.637 | 0.603 | 0.647 | 0.659 | 0.625 | 0.634 | 0.533 | 0.535 | 0.659 | 0.722 | 0.612 |
| -rank | 3 | 15 | 2 | 8 | | 11 | 5 | 1 | 16 | | 12 | 9 | 6 | 10 | | 14 | 13 | 7 | 4 | |
| Relative index of RDF | 0.944 | 0.604 | 0.991 | 0.967 | 0.868 | 0.859 | 0.730 | 0.887 | 0.765 | 0.811 | 0.770 | 0.863 | 0.779 | 0.735 | 0.786 | 0.652 | 0.702 | 0.869 | 0.871 | 0.773 |
| -rank | 3 | 16 | 1 | 2 | | 8 | 13 | 4 | 11 | | 10 | 7 | 9 | 12 | | 15 | 14 | 6 | 5 | |
| D. Smell | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.786 | 0.795 | 0.757 | 0.709 | 0.762 | 0.747 | 0.877 | 0.834 | 0.764 | 0.805 | 0.706 | 0.667 | 0.750 | 0.800 | 0.731 | 0.733 | 0.715 | 0.730 | 0.798 | 0.744 |
| -rank | 6 | 5 | 8 | 14 | | 10 | 1 | 2 | 7 | | 15 | 16 | 9 | 3 | | 11 | 13 | 12 | 4 | |
| Absolute index of RDF | 0.732 | 0.622 | 0.776 | 0.694 | 0.706 | 0.668 | 0.643 | 0.767 | 0.635 | 0.678 | 0.598 | 0.578 | 0.678 | 0.700 | 0.638 | 0.512 | 0.531 | 0.599 | 0.655 | 0.574 |
| -rank | 3 | 11 | 1 | 5 | | 7 | 9 | 2 | 10 | | 13 | 14 | 6 | 4 | | 16 | 15 | 12 | 8 | |

Appendix B : Contd.

| Acceptability index | Khon Kaen | | | | | Udorn | | | | | Ordinance Department | | | | | Quartermaster's Department | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age |
| Relative index of RDF | 0.931 | 0.782 | 1.025 | 0.979 | 0.927 | 0.894 | 0.733 | 0.920 | 0.831 | 0.841 | 0.847 | 0.867 | 0.904 | 0.875 | 0.872 | 0.698 | 0.743 | 0.821 | 0.821 | 0.772 |
| -rank | 3 | 13 | 1 | 2 | | 6 | 15 | 4 | 10 | | 9 | 8 | 5 | 7 | | 16 | 14 | 11 | 11 | |
| E.Total average | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.757 | 0.806 | 0.742 | 0.717 | 0.756 | 0.723 | 0.878 | 0.832 | 0.714 | 0.787 | 0.734 | 0.704 | 0.751 | 0.802 | 0.748 | 0.740 | 0.736 | 0.722 | 0.823 | 0.755 |
| -rank | 6 | 4 | 8 | 14 | | 12 | 1 | 2 | 15 | | 11 | 16 | 7 | 5 | | 9 | 10 | 13 | 3 | |
| Absolute index of RDF | 0.721 | 0.555 | 0.752 | 0.702 | 0.683 | 0.641 | 0.679 | 0.788 | 0.609 | 0.679 | 0.612 | 0.618 | 0.647 | 0.661 | 0.635 | 0.518 | 0.530 | 0.656 | 0.705 | 0.602 |
| -rank | 3 | 14 | 2 | 5 | | 10 | 6 | 1 | 13 | | 12 | 11 | 9 | 7 | | 16 | 15 | 8 | 4 | |
| Relative index of RDF | 0.952 | 0.689 | 1.013 | 0.979 | 0.903 | 0.887 | 0.773 | 0.947 | 0.853 | 0.863 | 0.834 | 0.878 | 0.862 | 0.824 | 0.849 | 0.700 | 0.720 | 0.909 | 0.857 | 0.797 |
| -rank | 3 | 16 | 1 | 2 | | 6 | 13 | 4 | 10 | | 11 | 7 | 8 | 12 | | 15 | 14 | 5 | 9 | |

TRD : Traditional (preparation) ; RDF : Roller-Dried Fish

Source : Computed according to formula (3.2) and (3.3) in Phase 1 's Report : May 1981

Apendex B.1

Economic Acceptability of Roller Dried Fish

| Preference at Price | Khon Kaen | | | | | Udorn | | | | | Ordinance Department | | | | | Quartermaster's Department | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age | Pla-ra song krueng | Hoh mok | Tau chiew lon | Nam prik pla-ra | Total aver-age |
| Sample Size | 56 | 72 | 67 | 67 | | 76 | 77 | 74 | 74 | | 46 | 51 | 52 | 50 | | 60 | 65 | 62 | 63 | |
| $P_{RDF} = P_{TRD}$ | | | | | | | | | | | | | | | | | | | | |
| 1. TRD | 57.1 | 80.6 | 34.3 | 35.8 | 52.0 | 50.0 | 80.5 | 40.5 | 56.8 | 57.0 | 67.4 | 60.8 | 57.7 | 12.0 | 49.5 | 85.0 | 80.0 | 53.2 | 55.6 | 68.4 |
| 2. RDF | 19.6 | 5.5 | 28.4 | 37.3 | 22.7 | 32.9 | 9.1 | 21.6 | 27.0 | 22.7 | 26.1 | 25.5 | 19.2 | 78.0 | 37.2 | 8.3 | 12.3 | 21.0 | 14.3 | 14.0 |
| 3. Either | 23.2 | 13.9 | 37.3 | 25.4 | 24.9 | 17.1 | 10.4 | 37.8 | 10.8 | 19.0 | 4.3 | 13.7 | 23.1 | 8.0 | 12.3 | 6.7 | 7.7 | 25.8 | 30.1 | 17.6 |
| 4. Uncertain★ | - | - | - | 1.5 | 0.4 | - | - | - | 5.4 | 1.3 | 2.2 | - | - | 2.0 | 1.0 | - | - | - | - | - |
| Rank of RDF(2&3) | 8 | 15 | 2 | 3 | | 5 | 14 | 4 | 11 | | 13 | 10 | 9 | 1 | | 16 | 12 | 6 | 7 | |
| $P_{RDF} = 3/4\ P_{TRD}$ | | | | | | | | | | | | | | | | | | | | |
| 1. TRD | 46.4 | 77.8 | 26.9 | 38.8 | 47.5 | 43.4 | 76.6 | 37.8 | 55.4 | 53.3 | 56.5 | 47.1 | 34.6 | 60.0 | 49.6 | 76.7 | 64.6 | 41.9 | 39.7 | 55.7 |
| 2. RDF | 37.5 | 15.3 | 46.3 | 46.3 | 36.6 | 43.4 | 16.9 | 62.2 | 37.8 | 40.0 | 41.3 | 52.9 | 61.5 | 38.0 | 48.4 | 23.3 | 32.3 | 58.1 | 60.3 | 43.5 |
| 3. Either | 16.1 | 6.9 | 26.9 | 14.9 | 16.2 | 13.2 | 6.5 | - | 4.1 | 6.0 | - | - | 3.8 | 2.0 | 1.5 | - | 3.1 | - | - | 0.8 |
| 4. Uncertain★ | - | - | - | - | - | - | - | - | 2.7 | 0.7 | 2.2 | - | - | - | 0.5 | - | - | - | - | - |
| Rank of RDF(2&3) | 8 | 16 | 1 | 4 | | 7 | 14 | 3 | 10 | | 11 | 9 | 2 | 12 | | 15 | 13 | 6 | 5 | |
| $P_{RDF} = 1/2\ P_{TRD}$ | | | | | | | | | | | | | | | | | | | | |
| 1. TRD | 32.1 | 73.6 | 19.4 | 37.3 | 40.6 | 42.1 | 72.7 | 37.8 | 52.7 | 51.3 | 39.1 | 41.2 | 28.8 | 48.0 | 39.9 | 56.7 | 47.7 | 33.9 | 65.1 | 50.8 |
| 2. RDF | 50.0 | 20.8 | 55.2 | 52.2 | 44.6 | 48.7 | 20.8 | 62.2 | 39.2 | 42.7 | 56.5 | 58.8 | 67.3 | 48.0 | 57.7 | 41.7 | 49.2 | 66.1 | 34.9 | 48.0 |
| 3 Either | 17.9 | 5.6 | 25.4 | 10.4 | 14.8 | 9.2 | 6.5 | - | 5.4 | 5.3 | 2.2 | - | 3.8 | 4.0 | 2.5 | 1.6 | 3.1 | - | - | 1.2 |
| 4. Uncertain★ | | - | - | - | - | - | - | - | 2.7 | 0.7 | 2.2 | - | - | - | 0.5 | - | - | - | - | |
| Rank of RDF(2&3) | 3 | 16 | 1 | 5 | | 9 | 15 | 6 | 12 | | 8 | 7 | 2 | 11 | | 13 | 10 | 4 | 14 | |

★ Includes those who said they were 'not sure' as well as those who gave no answer.

P : Price ; TRD : Traditional (preparation) ; RDF : Roller Dried Fish

Source : Computed according to formula (3.4) in Phase 1's Report ; May 1981

## Apendix C

### Physical Acceptability Index of Pla-pon

| Acceptability index | Khon Kaen | | | | | Udorn | | | | | Ordinance Department | | | | | Quartermaster's Department | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age |
| A. Color | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.797 | 0.790 | 0.766 | 0.742 | 0.774 | 0.753 | 0.836 | 0.857 | 0.774 | 0.805 | 0.730 | 0.696 | 0.780 | 0.734 | 0.735 | 0.717 | 0.750 | 0.779 | 0.785 | 0.758 |
| -rank | 3 | 4 | 9 | 12 | | 10 | 2 | 1 | 8 | | 14 | 16 | 6 | 13 | | 15 | 11 | 7 | 5 | |
| Absolute index of PP | 0.660 | 0.520 | 0.599 | 0.637 | 0.604 | 0.531 | 0.562 | 0.643 | 0.565 | 0.575 | 0.556 | 0.516 | 0.460 | 0.706 | 0.560 | 0.635 | 0.612 | 0.504 | 0.706 | 0.614 |
| -rank | 3 | 13 | 8 | 5 | | 12 | 10 | 4 | 9 | | 11 | 14 | 16 | 1 | | 6 | 7 | 15 | 1 | |
| Relative index of PP | 0.828 | 0.658 | 0.782 | 0.858 | 0.780 | 0.705 | 0.672 | 0.750 | 0.730 | 0.712 | 0.762 | 0.741 | 0.590 | 0.962 | 0.762 | 0.886 | 0.816 | 0.647 | 0.899 | 0.810 |
| -rank | 5 | 14 | 7 | 4 | | 12 | 13 | 9 | 11 | | 8 | 10 | 16 | 1 | | 3 | 6 | 15 | 1 | |
| B. Consistency | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.754 | 0.790 | 0.746 | 0.695 | 0.746 | 0.723 | 0.839 | 0.817 | 0.736 | 0.779 | 0.699 | 0.717 | 0.755 | 0.706 | 0.719 | 0.717 | 0.771 | 0.708 | 0.728 | 0.731 |
| -rank | 6 | 3 | 7 | 16 | | 10 | 1 | 2 | 8 | | 15 | 11 | 5 | 14 | | 11 | 4 | 13 | 9 | |
| Absolute index of PP | 0.602 | 0.512 | 0.556 | 0.605 | 0.569 | 0.486 | 0.531 | 0.626 | 0.541 | 0.546 | 0.515 | 0.446 | 0.455 | 0.658 | 0.519 | 0.619 | 0.571 | 0.546 | 0.636 | 0.593 |
| -rank | 6 | 13 | 8 | 5 | | 14 | 11 | 3 | 10 | | 12 | 16 | 15 | 1 | | 4 | 7 | 9 | 2 | |
| Relative index of PP | 0.798 | 0.648 | 0.745 | 0.871 | 0.763 | 0.672 | 0.633 | 0.766 | 0.735 | 0.701 | 0.737 | 0.622 | 0.603 | 0.932 | 0.722 | 0.863 | 0.741 | 0.771 | 0.874 | 0.811 |
| -rank | 5 | 13 | 8 | 3 | | 12 | 14 | 7 | 11 | | 10 | 15 | 16 | 1 | | 4 | 9 | 6 | 2 | |
| C. Taste | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.828 | 0.798 | 0.762 | 0.621 | 0.752 | 0.781 | 0.880 | 0.837 | 0.770 | 0.817 | 0.709 | 0.750 | 0.780 | 0.717 | 0.739 | 0.754 | 0.808 | 0.750 | 0.785 | 0.774 |
| -rank | 3 | 5 | 10 | 16 | | 6 | 1 | 2 | 9 | | 15 | 12 | 8 | 14 | | 11 | 4 | 12 | 7 | |
| Absolute index of PP | 0.625 | 0.464 | 0.567 | 0.609 | 0.566 | 0.486 | 0.432 | 0.657 | 0.503 | 0.520 | 0.480 | 0.462 | 0.450 | 0.630 | 0.506 | 0.615 | 0.604 | 0.538 | 0.640 | 0.599 |
| -rank | 4 | 13 | 8 | 6 | | 11 | 16 | 1 | 10 | | 12 | 14 | 15 | 3 | | 5 | 7 | 9 | 2 | |
| Relative index of PP | 0.755 | 0.581 | 0.744 | 0.981 | 0.753 | 0.622 | 0.491 | 0.785 | 0.653 | 0.636 | 0.677 | 0.616 | 0.577 | 0.879 | 0.685 | 0.816 | 0.748 | 0.717 | 0.815 | 0.774 |
| -rank | 6 | 14 | 8 | 1 | | 12 | 16 | 5 | 11 | | 10 | 13 | 15 | 2 | | 3 | 7 | 9 | 4 | |
| D. Smell | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.801 | 0.778 | 0.734 | 0.684 | 0.749 | 0.777 | 0.849 | 0.813 | 0.736 | 0.794 | 0.719 | 0.707 | 0.745 | 0.690 | 0.715 | 0.717 | 0.733 | 0.738 | 0.719 | 0.727 |
| -rank | 3 | 4 | 9 | 16 | | 5 | 1 | 2 | 8 | | 11 | 14 | 6 | 15 | | 13 | 10 | 7 | 11 | |
| Absolute index of PP | 0.613 | 0.520 | 0.591 | 0.621 | 0.586 | 0.562 | 0.469 | 0.640 | 0.544 | 0.554 | 0.536 | 0.484 | 0.465 | 0.647 | 0.533 | 0.570 | 0.554 | 0.533 | 0.605 | 0.566 |
| -rank | 4 | 13 | 6 | 3 | | 8 | 15 | 2 | 10 | | 11 | 14 | 16 | 1 | | 7 | 9 | 12 | 5 | |

Appendix C : Contd.

| Acceptability index | Khon Kaen | | | | | Udorn | | | | | Ordinance Department | | | | | Quartermaster's Department | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age |
| Relative index of PP | 0.765 | 0.668 | 0.805 | 0.908 | 0.782 | 0.723 | 0.552 | 0.787 | 0.739 | 0.698 | 0.745 | 0.685 | 0.624 | 0.938 | 0.745 | 0.795 | 0.756 | 0.722 | 0.841 | 0.779 |
| -rank | 7 | 14 | 4 | 2 | | 11 | 16 | 6 | 10 | | 9 | 13 | 15 | 1 | | 5 | 8 | 12 | 3 | |
| E. Total average | | | | | | | | | | | | | | | | | | | | |
| Absolute index of TRD | 0.795 | 0.789 | 0.752 | 0.686 | 0.755 | 0.759 | 0.851 | 0.831 | 0.754 | 0.799 | 0.714 | 0.718 | 0.765 | 0.712 | 0.727 | 0.726 | 0.766 | 0.744 | 0.754 | 0.748 |
| -rank | 3 | 4 | 10 | 16 | | 7 | 1 | 2 | 8 | | 14 | 13 | 6 | 15 | | 12 | 5 | 11 | 8 | |
| Absolute index of PP | 0.625 | 0.504 | 0.578 | 0.618 | 0.581 | 0.516 | 0.499 | 0.642 | 0.538 | 0.549 | 0.522 | 0.477 | 0.458 | 0.660 | 0.530 | 0.610 | 0.585 | 0.530 | 0.647 | 0.593 |
| -rank | 4 | 13 | 8 | 5 | | 12 | 14 | 3 | 9 | | 11 | 15 | 6 | 1 | | 6 | 7 | 10 | 2 | |
| Relative index of PP | 0.786 | 0.639 | 0.769 | 0.901 | 0.770 | 0.680 | 0.586 | 0.773 | 0.714 | 0.687 | 0.731 | 0.664 | 0.599 | 0.927 | 0.729 | 0.840 | 0.634 | 0.712 | 0.858 | 0.793 |
| -rank | 5 | 13 | 7 | 2 | | 11 | 15 | 6 | 9 | | 8 | 12 | 16 | 1 | | 4 | 14 | 10 | 3 | |

TRD : Traditional (preparation) ; PP : Pla-pon

Source : Computed according to formula (3.2) and (3.3) in Phase-1's Report : May 1981

## Apendix C.1

### Economic Acceptability of Pla-pon

| Preference at Price | Khon Kaen | | | | | Udorn | | | | | Ordinance Department | | | | | Quartermaster's Department | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age | Pla-ra song krueng | Hoh mok | Kai-jiew pla | Kaeng som | Total aver-age |
| Sample Size | 64 | 62 | 63 | 64 | | 73 | 73 | 75 | 73 | | 49 | 46 | 50 | 46 | | 61 | 60 | 60 | 57 | |
| $P_{PP} = P_{TRD}$ | | | | | | | | | | | | | | | | | | | | |
| 1. TRD | 67.2 | 85.5 | 65.1 | 40.6 | 64.6 | 75.3 | 93.1 | 56.0 | 71.2 | 73.9 | 75.5 | 93.5 | 82.0 | 50.0 | 75.2 | 60.7 | 71.7 | 75.0 | 49.1 | 64.1 |
| 2. PP | 3.1 | 3.2 | 7.9 | 23.4 | 9.4 | 6.8 | 1.4 | 16.0 | 11.0 | 8.8 | 4.1 | - | 2.0 | 23.9 | 7.5 | 13.1 | 11.7 | 8.3 | 12.3 | 11.3 |
| 3. Either | 29.7 | 9.7 | 25.4 | 35.9 | 25.2 | 16.4 | 5.5 | 28.0 | 12.3 | 15.6 | 20.4 | 4.3 | 16.0 | 26.1 | 16.7 | 26.2 | 15.0 | 16.7 | 38.6 | 24.1 |
| 4. Uncertain★ | - | 1.6 | 1.6 | - | 0.8 | 1.4 | - | - | 5.5 | 1.7 | - | 2.2 | - | - | 0.6 | - | 1.7 | - | - | 0.6 |
| Rank of PP (2&3) | 7 | 14 | 6 | 1 | | 12 | 15 | 4 | 11 | | 10 | 16 | 13 | 3 | | 5 | 8 | 9 | 2 | |
| $P_{PP} = 3/4\ P_{TRD}$ | | | | | | | | | | | | | | | | | | | | |
| 1. TRD | 64.1 | 82.2 | 61.9 | 37.5 | 61.4 | 72.6 | 87.7 | 54.7 | 71.2 | 71.5 | 69.4 | 87.0 | 76.0 | 45.7 | 69.5 | 42.6 | 71.7 | 60.6 | 38.6 | 53.2 |
| 2. PP | 14.1 | 6.5 | 17.5 | 35.9 | 18.5 | 23.3 | 11.0 | 42.7 | 23.3 | 25.1 | 20.4 | 8.7 | 24.0 | 54.3 | 26.8 | 54.1 | 25.0 | 38.3 | 61.4 | 44.7 |
| 3. Either | 21.9 | 9.7 | 19.0 | 26.6 | 19.3 | 2.7 | 1.4 | 2.7 | - | 1.7 | 10.2 | 2.2 | - | - | 3.1 | 3.3 | 1.7 | 1.7 | - | 1.7 |
| 4. Uncertain★ | - | 1.6 | 1.6 | - | 0.8 | 1.4 | - | - | 5.5 | 1.7 | - | 2.2 | - | - | 0.6 | - | 1.7 | - | - | 0.4 |
| Rank of PP (2&3) | 8 | 14 | 7 | 1 | | 11 | 15 | 5 | 13 | | 9 | 16 | 12 | 4 | | 3 | 10 | 6 | 2 | |
| $P_{PP} = 1/2\ P_{TRD}$ | | | | | | | | | | | | | | | | | | | | |
| 1. TRD | 56.2 | 74.2 | 50.8 | 39.1 | 55.1 | 72.6 | 84.9 | 50.7 | 67.1 | 68.8 | 49.0 | 73.9 | 68.0 | 41.3 | 58.0 | 34.4 | 53.8 | 51.7 | 31.6 | 44.0 |
| 2. PP | 21.9 | 11.3 | 23.8 | 39.1 | 24.0 | 23.3 | 13.7 | 46.7 | 24.7 | 27.1 | 40.8 | 21.7 | 32.0 | 58.7 | 38.3 | 62.3 | 38.3 | 48.3 | 66.7 | 53.9 |
| 3. Either | 21.9 | 12.9 | 23.8 | 21.8 | 20.1 | 2.7 | 1.4 | 2.7 | 2.7 | 2.4 | 10.2 | 2.2 | - | - | 3.1 | 3.3 | 1.7 | - | 1.7 | 1.7 |
| 4. Uncertain★ | - | 1.6 | 1.6 | - | 0.8 | 1.4 | - | - | 5.5 | 1.7 | - | 2.2 | - | - | 0.6 | - | 1.7 | - | - | 0.4 |
| Rank of PP (2&3) | 9 | 15 | 8 | 3 | | 13 | 16 | 6 | 12 | | 5 | 14 | 11 | 4 | | 2 | 10 | 7 | 1 | |

★ Includes those who said they were 'not sure' as well as those who gave no answer.

P: Price ; TRD : Traditional (preparation) ; PP : Pla pon

Source : Computed according to formula (3.4) in Phase 1's Report ; May 1981